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MAJOR-GENERAL THE HON. J. LINDSAY, M.P. in the Chair.

ENGLAND, HER WARS, AND EXPEDITIONS, SINCE 1815.

By COLONEL ADAIR, A.D.C. to the Queen.

PART I.

THE CHAIRMAN said it was hardly necessary to introduce Colonel Adair to the audience, as he had often addressed them before. He never took up any subject which he did not thoroughly understand; and when he did introduce one, he always did so with very great ability.

COLONEL ADAIR: With regard to the subject which I shall have the honour to treat to-day, it has not escaped my notice that I am obnoxious in a very considerable degree to a charge of presumption, in attempting to set forth the military achievements since 1815, by land and sea, of an empire which has carried its warfare wider and deeper than has any known to civilisation, with the exception perhaps of the Spanish monarchy. Vast as was the space which the Roman eagles overshadowed, it was narrow compared to that over which the English standards wave. Therefore it is that, deprecating no criticism, yet requesting rather a liberal judgment of the purpose with which I approach this noble task, than as conceiving that I deal with it exhaustively, I shall now proceed.

In the first place, it will be recollected that England stands amongst military and colonizing nations almost without a parallel or an example in her need to conduct warfare of varying types. On her, rests the obligation of enforcing by warlike means the due execution of treaties; on her, also, falls the obligation of protecting her colonies proper; and on her devolves the duty of defending, no less than of administering, the territories that have been gathered beneath her sway. Hence she is destined to assimilate and practise specialities of warfare differing in degree and in character from those proper to nations which, possessing no colonies, or but few, wage a warfare limited to a single class of operations in

field or siege. For instance, it is incumbent on those who wield the military strength of England to be prepared to confront an enemy campaigning by rule of European science, as in the wars of the Peninsula and of the Crimea, and those who, being in part trained to the Asiatic and desultory mode of fight, have nevertheless adopted, in a certain sense, the European system of tactics and of organization—such as the Persian, the Chinese, the Mahratta, and the Sikh. Again, there are the warlike races who, relying on their national and appropriate system of warfare—as the Affghans and the Burmese—must be treated with a strategy varying in relation to the habits of undisciplined, yet not despicable, foes. England has also to encounter with those races, unbroken in their savage strength, resolute, and partially barbarous, which do not shrink from the British troops in the field, trusting, and not without warrant at the outset, to the natural strength of the country, which has suggested their not incomplete organization—such as the Kaffir and the New Zealander. For all the exigencies of such dissimilar campaigns, an English war administration must be prepared. Now, it would seem that the generic distinction between the system of European strategy and the system of the Asiatic—that is, of what may be called local tactics—consists mainly in the preponderance given to the scientific employment of infantry and of siege artillery by generals manœuvring and campaigning on principles of military science. The Asiatics of the Indian Peninsula, for instance, have shewn great skill in casting heavy guns, and in delivering masses of artillery fire in position; while they are not successful in the employment of siege artillery. The cavalry of Africa and of Asia is capable of wonderful efforts, even in their partly trained squadrons; but in the European system of warfare alone, due and scientific preponderance is given to the combined movements of infantry, to which, from the days of the Spanish Bands down to those in which the solidity of the British regiments attracted the admiration of their allies, the victory in all great battles in Europe, with but a single exception, has been ascribed. For the employment of siege artillery the Asiatic genius is notoriously unfitted.

Such being the duties of England, to what extent has she been compelled to develop her military resources? Since 1815, in the four quarters of the globe twenty-two wars have been waged by her arms, concluded by the sharp struggle of the Indian mutiny, equivalent in proportion and manœuvres to four wars—certainly to four sternest campaigns. Twenty expeditions within that time have been carried to the extremity of the earth. In that period every form and manner of war has been experienced and tested, and therefore it may be thought that some general rules are deducible from such wide and severe experience for the future guidance and organization of her troops, for the policy in conducting wars, and for the application of strategy. And it is worthy of especial remark that, while the military virtues have never ceased—overlaid, as they were supposed to be, by the security that a long peace had induced—yet the general organization of her armies, in consequence of the long peace, had not corresponded to the latent powers of the magnificent machine to which substance and permanence were to be supplied. Nor has adequate preparation always preceded war; just as it has been proved too fatally that sufficient means of maintaining warlike effort with vigour has not always been supplied.

Now, of the peculiarities of the British service. The chief duty, is the colonial, which causes the largest demand upon the national forces; for the colonial service, comprehending all our dependencies in their wide bounds, troops must be raised partly in the colonies and dependencies, but to be led by regiments sent from England. Therefore, the first principle to be deduced would be, that the unit of organization of the British army should be the single battalion; a distinction being drawn between the regimental, as understood in England, and the brigade system of continental armies, in which the single or the two-battalion regiment is the exception, and the four-battalion or the brigade corps is the rule. Where large masses can be kept permanently in the same quarters or province, it is well to organize regiments in several battalions; where it is desirable, as in the detachment service of the colonial empire of England, that every fraction of the unit should be complete in itself, the regimental is the appropriate organization. If, then, dependence is mainly to be placed on the efficiency of troops in small bodies, trained to act independently, which yet in no degree diminishes the aptitude for consolidation, but rather prepares, by effective instruction, for large consolidation—if it be not practicable to raise suddenly large masses of troops, as in military states, then it is imperative to give a high training to the individual soldier. Much progress in that respect has been lately made. The regimental system was well understood, as between officer and men, even before the Crimean war; it scarcely admitted of improvement. But the weapons were inferior to the soldier's military merits; tactics admitted of simplification, and have been simplified, whence a larger usefulness has been given to the physical power and mental energy that unite to mark the British soldier.

Moreover, if the soldier's training should be complete, the machinery which is to keep the army effective must not be restricted in its composition or scope. Hence arises the need for a staff corps effective for all military purposes, and numerically adequate to the demands of multiform and disseminated warfare; for many are the opportunities of applying the labours of the scientific corps in giving weight by skill to the scanty numbers which are available, ordinarily, for British warfare. Then, while the soldier looks for few luxuries in the field, he should receive, without stint or delay, constant and steady supplies to maintain his strength, to recruit his strength, and to restore his health, if for a time he be unfitted, by disease or wounds, for the line of battle.

Such being the principles, as regards the soldier, of a British system rightly applied, what are the rules most suitable for the external military policy of the empire? The natural fortresses of England are such as Gibraltar, or Aden, placed at the extremity of a territory, no matter how hostile, so that the sea be open; or of islands within whose harbours may be concentrated fleets designed to maintain communications between the fortresses, maritime, peninsular, or insular, and the mother country. In this portion of our military policy, we rightly follow the example of two of the most successful of the colonising nations—the Genoese, who strengthened points on the mainland with forts, and the Venetians, who occupied islands, whence neither were driven forth, while true to the policy which dictated such occupation.

Hence arises another principle of British strategy, namely, to treat the

sea always as the British base of operations. England is often practically nearer the base which governs operations, by sea, than other countries are by land, seeing that distance is of little moment, in comparison with facility of access, and regularity of passage. The base of operations being by sea, a base of operations by land is dispensed with; and on cognate reasons those campaigns have been carried out with the happiest effect, of which the line of operations has been drawn through fluvial districts. Again, in the progress of wars in isolated or remote regions there is one rule which, in the most complicated campaigns of our wars of manœuvre —Kafir or Indian—should always be respected, confirmed as it is by the opinion of the Duke of Wellington. It is this—never to retreat before an Asiatic or a barbarous enemy; and further, to break up combinations of hostile tribes by moveable columns, employed with much effect in the Kafir war, and against the Indian mutineers. And thus the essential predominance of highly trained infantry will be maintained.

There is yet another law important to the military policy of England, whether a general leads contingents, or acts in combination with independent allies. Let the general who leads contingents be absolute in his authority. If British troops be required to co-operate with an ally, let the lines of operation be distinct and well-defined, and suitable to the genius of each army, in order to the largest results. For, inasmuch as each class of war is special to each particular army, each has its particular gift and appropriate military style; in order to common objects, the efforts of allies should be, to use a mathematical expression, rather convergent than combined, since communications may be maintained, though contiguity be avoided.

The warfare of England may be divided into three classes: the warfare of obligation by treaty, the colonial, and the warfare of territorial defence. It is now proposed to notice briefly the wars of obligation by treaty, and the less important maritime expeditions. On a second occasion, two colonial wars, the Kaffir, and New Zealand, and the larger maritime wars, of China, and of Burmah, and some few of those land expeditions in India, which, on account of the genius, the active courage, and the endurance manifested, deserve a chapter in the military history of England, though in the blaze of our bolder successes they may have escaped the observation of our countrymen. The third and last division will comprise the Indian wars of tactics, and of the higher class of strategy. Nor will those who have studied the history of the two Affghan campaigns, the campaign of Scinde, and of the Cutchi hills; the Sikh campaigns, the second and third Mahratta wars, the Nepâl war, and lastly, the magnificent combinations by which the Indian mutiny was trodden out, hesitate to maintain the credit of British strategy against any parallels drawn from the campaigns of Europe.

And first, of the wars that succeeded to the great cycle of strife closed in 1815. It would, at the first glance, seem that since the twenty-five years of devastation which blazed round the world, from the storm of the Bastile to the last Cossack rush on the barriers of Montmartre, that England had been lightly visited with the plague of war; but year after year, in tracing our military records, brings its history of strife.

It is difficult to include in the previous definitions the wars in which England conceived herself imperiously urged to action in behalf of huma-

nity. From such strife her sword has never been withheld; and the first occasion after the occupation of Paris was at the bombardment of Algiers. Supinely had the European powers endured the ascendancy of the corsair in the Mediterranean. Since the days of Blake, Cromwell's admiral, a practical impunity was granted to the predatory power of the pirates of Algiers; for the Spanish enterprise failed in its completion, and the French under Louis XIV. gained no solid advantage; whence it was not till the combined fleet of England and of the Netherlands bombarded Algiers in 1816 that the plague was effectively stayed for a season, to be finally and utterly annihilated by the arms of the French people. This naval action was distinguished, as usual, by the characteristic skill and the still more characteristic coolness of the British navy and of its gallant ally. To the naval genius of the two kingdoms exclusively this triumph is due. From the hour on that August afternoon when Lord Exmouth laid the flag-ship within fifty yards of the Algerine batteries, till the last shot was fired at ten p.m., was one continued exhibition of masterly skill and science by the allied squadrons, and of resolute vigour by the Algerines. If one result of seamanship be specially selected, it would be placing the Granicus in the line, under fire, through the dense smoke; for it is principally with the view of drawing attention to the progressive results of artillery fire, that I remark on the armaments. So many of 866 guns as could be trained from the decks of the allied squadron kept down the fire and disabled 700 guns on the sea-faces of Algiers, against the combined advantages of position and concentration and an effective preponderance of available ordnance. The expenditure of 118 tons of powder and 500 tons of shot attest the severity of the cannonade. The characteristic of the action is a vigorous and direct fire from the fleets and batteries, with the partial employment of rockets and shells.

But not alone on the African seaboard were the naval expeditions of the country covered, as usual, with distinction. The expedition of the Persian Gulf to Ras-el-Khyma, a fortified town on a peninsula, in 1819, proves in its successful issue of how powerful an organisation the combined efforts of our military and our naval strength are susceptible. The troops sailed from Bombay in December, 1819, were landed on the 2nd, the trenches were opened on the 4th, and the town was stormed on the 8th. The 47th and 65th King's, the flank companies of some Sepoy regiments, and the Honourable East India Company's artillery and engineers, formed the land force of five thousand men. Three English men of war, the "Liverpool," 50, "Eden," 26, "Curlew," 18, and the Honourable East India Company's cruisers and mortar boats co-operated. Within these four days, piracy on that coast was extirpated. The expeditions against Borneo in the Eastern seas and the pirates of the Mediterranean attest the pervasive power and the unselfish policy of England. Successive expeditions also penetrated, in 1835 and 1847, from Cape Coast Castle to the town of Apollonia. It lies in the interior, at a considerable distance from Cape Coast Castle, and thither an expedition was directed in order to check the land piracy in that district, with but partial success.

Amongst the minor operations by land on the African continents, arose an unexpected war, not unchequered with disaster, in that inroad which resulted, in 1824, in the defeat of the troops, at Cape Coast Castle, by the Ashantees. But repulse and disaster, developed the strength of the

British resource; and the Ashantee forces, hurled and shattered against Cape Coast Castle, withdrew, to encounter, at no distant day, so conclusive and decisive a defeat, that of them, again, no more warlike mention has been heard to trouble the frontier.

The capture in 1839 of Aden, situated on its rocky peninsula, gave an Arabian Gibraltar to England, and a fortress of strength to protect and supply her Indian communications. There is an expedition however which merits special notice on account of the distance from home at which operations were undertaken, and the use of a most remarkable species of attack—the allied English and French expedition to the Parana in 1845. It may be remembered, that the political troubles in the Argentine Republic had interrupted trade on the affluents of the Plate and necessitated an expedition to restore to commerce the freedom of the rivers which drain half a continent. Batteries were thrown up by the native troops on either bank of the united streams of the Paraguay and Parana, aided by a boom, though not of sufficient power to close the ascent of the river to the allied squadron and convoy, under the command of the late Sir Charles Hotham at the battle of Obligado. But, though the convoy had passed up, it was seen that much peril must be encountered on the return. Additional batteries were thrown up, which subsequently proved their power in the well-known fight of San Lorenzo, while field batteries, whose unfettered movements suited the nature of the country and the genius of the native troops, engaged the squadron with a fire impossible to avoid and difficult to keep down. Hence it was essential to clear the way for the squadron and convoy in descent to the broader estuary of the Plate. It was evident that to despatch a steamer to feel the way would draw attention; yet, by a stratagem conceived with singular hardihood and by decided action of a character previously unknown to warfare, these batteries were overpowered and the command of the river obtained. For some three days before the squadron was to weigh and bring down the merchantmen collected above, a boat expedition was fitted out with heavy rockets, which occupied and lay masked on a sandbank in front and within range of the main land batteries undiscovered for forty-eight hours. But when the approach of the squadron down the stream with its convoy was signalled, the rocket battery from the ambush opened on the enemy's batteries on the left bank. The way was thus cleared for the allied squadron, and the convoy passed the shore batteries in safety. Considering then the remoteness of the scene of this exploit, the remarkable skill and steadiness manifested in its execution, and genius displayed in conception, the affair of San Lorenzo has deserved distinguished notice.

In support of treaty-rights, Mr. Canning sent in 1827 a small force of five thousand men to Portugal. There is no incident on which we need pause for military purposes in that campaign. Nor, while referring to the Spanish naval campaign of 1836, which was a consequence resulting from the Quadruple Alliance, will the successes of the Anglo-Spanish Legion be detailed, since the course of this history must be restricted to a notice of the operations of armies enrolled in the regular forces of the Crown. By those who recall the triumphs of British volunteers, under leaders trained in English discipline, by land and sea, in South America, in Greece, in Spain, in Portugal, in Central America, wherever national liberty was to be achieved, it will not be supposed that lack of glorious actions to narrate

imposes this unwelcome silence. But, on the reason given, I can but notice the co-operation of the royal navy and the gallant behaviour of that battalion of royal marines which on the mainland stood side by side with the soldiers of the Anglo-Spanish Legion.

I now approach with regret the story of a war waged against British subjects. In the revolt of Canada in 1837 is noticeable the remarkable energy with which the regiments in Nova Scotia and New Brunswick, in the depth of a Canadian winter, marched 700 miles, to restore to the sovereignty of the British Crown a country too valuable to be lightly cast from us, and whose soldiers are now enrolled in the line of the British army.

A maritime expedition directly consequent on those treaty obligations which England has respected and maintained at immense cost, and little positive advantage in a material sense, was undertaken in 1827, in concert with France and Russia, as essential to the balance of power. The Greek revolt had reached in 1827 a point of success which caused the Sultan to call in the aid of his feudatories from every quarter. The rights of conquest were abused by the Egyptian troops with a terrible barbarity; the Morea was laid almost desolate; and it was then that the three Powers determined to check these enormities. It was a stern and terrible fight in the Bay of Navarino, contested with the courage of five races, whose genius for war is unquestioned; for, although the Egyptian had not been long known in the field, yet in his ranks existed the ancient Turkish persistence and endurance. That naval action was one of the few that have been fought at anchor. The loss of the Ottoman squadron and slaughter were severe, though the period of action was but short; and the result achieved against the habitual preponderance of metal in a Turkish fleet—2,200 guns against 1,300—was, that the action, which had commenced with the murder of the pilot of the "Asia," terminated by the well nigh total destruction of the Turco-Egyptian squadron. The Russians and the French showed themselves on that day not unworthy to carry pendants alongside of the British fleet.

But, as time wore on, the inherent disorders of the Turkish empire led to disunion and a contest between the Sultan and Mehemet Ali. The Egyptian occupation of Syria in 1840 and successful battles in Asia Minor brought the governments of the Queen and of the Emperor of Austria to reflect that, to maintain the peace of Europe, then endangered by the withdrawal of the French Government from the Western Alliance, the war raging in Syria must be stayed. The combined squadron of England, of Austria, and of Turkey swept the Levant; and in the bombardment of Beyrout, of Gebail, of Sidon, and of Acre, and the storm of the camp of Calat Meidan, laid the foundations, as it was hoped, of enduring security to the Turkish empire.

Lastly, before reviewing the incidents of the fiercest struggle in Europe since the Peninsular campaigns, the history of the first and second Persian wars should be noticed. The first Persian war of 1838 was marked by the occupation of the island of Karak, and terminated by the concessions of the Shah. The second war, commenced in 1856, led to a longer strife, won with signal advantage to the policy of England. At this conjuncture, was prominently assumed, by that soldier whose name will be known to the end of time in connection with the story of the Indian mutiny, and whose

death found mourners amongst those who speak the English tongue even beyond the Atlantic, that place to which talent, valour, and patience entitled him. The rapidity with which these forces were organized in November, 1856, and directed from the Western Presidency upon Bunder Abbas; the occupation of Karak; the bombardment and storm of Reshire; the storm of the camp of Bassadore; the evacuation of the camp of Burasgoor, in sixty-four days—are all proofs of the alacrity and the energy with which a British expedition can be fitted out, even in her remote dependencies, and successes achieved. But this war is also characterized by a special application of tactics, and by great daring of the troops. After the destruction of the camp of Burasgoor, the troops retired, followed by 7,000 Persians, who formed up at Koosh-Ab. On that glorious day the resolute rush of the 3rd Bombay cavalry drove into fragments the Persian squares, shattered already by artillery fire. An expedition was then launched against a position, strong by nature and art, at Mohumrah. The operations were conducted exclusively under the orders of Colonel Havelock. The Persian camp on the Shat-el-Arab was supported by a fort, but not covered by intrenchments. Havelock, therefore, with a prompt insight, embraced the opportunity of making a movement most successful; in its novelty, indicating unwonted fertility of resource. In the orders of the day, here briefly abstracted, it appears: 1. The first line to be composed of the two brigades; guns in the intervals; the second, of the cavalry. 2. As soon as the troops have reached ground on which they can freely manœuvre, the left brigade to advance transversely to their original front; in open column of companies; left in front; the artillery following in column of half batteries. 3. The right brigade to be moved in the same order until the head of the column reaches the left of the original line, when it will wheel into line and advance in the same order. 4. Thus the troops will be conducted to the attack of two sides of the camp, the right brigade being held in reserve, until the left, having wheeled into line, has successfully assaulted the enemy, the artillery opening on the enemy in the space between the two brigades. 5. The cavalry will move in second line. The result was the defeat and destruction of that division of the Persian force.

There yet remained one trial for the British troops. To the north-east, on the river Karoon, at a distance of one hundred miles, was a post seized by seven thousand Persians, with cavalry and guns, at Ahwaz. The advance of the British troops dispersed this force, and the expedition was then withdrawn, to encounter less noble warfare on the continent of India.

I now approach the consideration of the greatest war that England has carried on in one single effort—a war which, swelling in its progress to vast and unexpected proportions, terminated by maintaining incontestably the renown of the army of England which it had attained in the Peninsula. This war witnessed the rise of novel formulæ in tactics, a profuse application of improved ordnance in armament, in the use of new works of defence, in rare combinations for attack, and in fact developed questions on every condition of the long-agitated problem, whether the science of defence or of attack is the most advanced. The solution is not yet attained, and can only be attained by many trials. In tracing the course of the allied troops at Constantinople, the advance to Varna, and from

Varna to the Crimea, the progressive development and widening scope of operations from month to month attract notice. The expedition to Gallipoli was at the outset thought to be sufficient indication of the purposes of the Allies. Secondly, it appeared that a line drawn to the northward of the capital from the Black Sea to Enos to check the direct advance of the Russian forces, and a flank movement to the Mediterranean, as had been the case in Diebitsch's campaign of 1829, would have satisfied diplomatic necessities. But month after month an ever-increasing necessity was imposed upon the Allies. The advance upon Varna was decided, and from Varna the surprise of the Russian army in the Crimea was projected. Then was seen what a task it is to undertake a war in a country of which the circumstances have not been thoroughly studied. The Allies learned how perilous is the risk of measuring the actual strength and possible resources of an enemy by their own, and not by his standard; yet, after the miserable sufferings and terrible losses of an armistice, caused by the exhaustion of the Allies, and virtual, though unrecognised, from November 1854 to April 1855, they emerged from that war with larger experience, with chastened pride, but also with renewed glory.

It may be called a campaign, and yet not a campaign, for it is a campaign with scarcely a manœuvre. It may be called a siege, and yet not a siege, since in the partial investment of Sebastopol the conditions of a siege were reversed. It was a siege, with the responsibilities of a campaign, and the urgencies of a campaign, and yet without those means of tactical movement and strategic skill which compensate numerical deficiencies. Like the siege of Alesia, it was one of circumvallation and contravallation against a superior garrison within, and aggressive armies without. Each army after its own fashion pushed forward the approaches: the British for bombardment, the French for sap, through approaches hewn in the rock. The naval fire fell harmless against the harbour forts, but the high-placed batteries sorely stung the ships of the Allies on the day of the naval bombardment. In the numbers of the garrison, in the supplies of ordnance and of warlike stores, in all *matériel* necessary for the maintenance of a siege, the habitual conditions of a siege were reversed. Instead of the beleaguring army investing the entire *enceinte*, to invest a part sorely taxed their strength. And in the second month of open trenches the arithmetical proportions that a besieging force should bear to a garrison were it seems positively and absolutely reversed. In November 1854 the Russian muster-roll gave 100,000 men to 50,000 of the Allies.

Again, it was a siege remarkable for the skill and rapidity with which defensive works were extemporised, and for the unusual importance that works assumed, to which previously preponderance in defence had not been attributed. For instance, a hurriedly constructed earthwork on a Mamelon, neglected despite the warning of our chief engineer, kept at bay the advances of the Allies for many months. An ordinary earthwork on the Redan trace became a substantive front of defence; and so of other portions of the defensive works; while an advanced zone of Russian rifle-pits showed a garrison capable of utilising tactics appropriate to the besieger. Yet one special immunity was vouchsafed to the belligerents on either part in this war. From the peculiar position of Sebastopol, this siege supplies the only example known to history in which the weight of

fatigue, of wounds, famine, and pestilence, and of the nameless sorrows and horrors that intensify the ghastliness of war, fell upon the combatants alone. There was no country devastated; the inhabitants were removed, and a free retreat to the close of operations was possible to the non-combatants. The siege was fought out by soldiers, soldier fashion; and, however embittered the national Russian feeling may have been at the conclusion of this strife, the sorrows and the agonies of private grief were not exasperated by calamities endured in the operations on the principal theatre of the war. Happy, indeed, if the historian could record that a like impunity to the non-combatant had attended minor operations.

Some have believed that on the first advance the city might have fallen before a *coup-de-main;* or it was at least supposed that the bombardment of October would justify an assault, and thence the surrender of the southern city. Promptly and sharply was that expectation rebuked: the artillery fire was soon suspended, or maintained only by infrequent rounds, from October 17th to the 26th, 1854, till the second bombardment, in April 8th to the 21st, 1855. Though the operations in the field and the trench-work were going on successively during those months with such speed as the over-worked troops could attain, there was little room for the employment of siege artillery. But in that interval came the battle of Inkermann; in that interval succeeded the mournful yet glorious day, honourable to both branches of our admirable cavalry at Balaklava; and many a well-fought contest in the trenches, in the sorties, wherein no less resolution was shown than in other more noticeable episodes of the war.

But I will remark the characteristic movement of the day of Inkermann. It was by providential accident that the over-tasked strength of the British soldier was, on that day, spared a heavier stress, from the error of General Goimonoff. The mistake of bringing up his column on the left of the Careening Bay ravine, instead of keeping the ravine on his left, is clearly and accurately shewn in the work of Colonel Adye, R.A. Hence the important advantage of meeting on a narrow front of plateau the Russian forces, masked by columns, in their enormous strength, outnumbering the divisions engaged as six to one. But the attack was repulsed, and the siege batteries were not to be menaced by fire established in reverse.

Pending a reference to the renewed bombardments and subsequent actions of the spring of 1855, let me notice the rapid diffusion of this war, which, bursting out as a small spark from the batteries of Silistria, spread the conflagration over the seas of the world, and over the borders of two continents. From that day in March when war was declared against Russia, the Baltic squadron sped its way to effect the capture of the Bomarsund forts, and the bombardment of Sweaborg. In the Black Sea the allied squadrons earned credit by their accuracy of fire at the bombardment of the batteries of Odessa, by sweeping the coasts of Azof, and by the destruction of the fort of Kinburn. Nor in these seas alone were the combatants destined to meet. In the Upper Pacific, the war reached Petropaulofski, while the British pendants were carried beyond the North Cape, into the very confines of the Arctic Ocean. The defence of Kars, the occupation of Eupatoria, the diversion in Mingrelia, and on the Circassian coast, complete the circle of warlike operations.

The general operations of the siege were postponed till the spring

should bring fresh troops, and augmented supplies to the allied armies. In the spring, operations were resumed by bombardments coincident with movements of infantry, and with operations in the field. A gradual but perceptible advance in the scale of the British armament was effected, as in the French; though to avoid complication I refer exclusively to the British armament. In the first bombardment, in October, 1854, ten mortars and 62 guns were in position; this number had reached, in the sixth bombardment, of the 8th of September, 1855, 91 mortars, and 116 guns. The second bombardment was conducted on the 8th of April, with 36 mortars, and 87 guns. The third bombardment, on the 5th of June, with 43 mortars and 111 guns; and on this bombardment followed the capture of the Mamelon, by the French troops, and the occupation of the Quarries by the British. On the 4th of June, the British bombarding power was increased to 55 mortars, with 111 guns, as before; but the gallant attempt of the French to seize the Malakoff failed. Our troops compensated the partial repulse of the Redan, by the success of the Garden and Barrack batteries; but the result of the day's struggle made it evident that additional strength was needed, before Sebastopol could be wrenched from the Russian grasp. On the 6th June, was fought the battle of Traktir; whereon it would ill befit one speaking amongst British soldiers to omit notice of the conduct of the Sardinian troops, few in number, and exposed to the heavy force of the Russian masses, and the weight of shot and shell from the Russian guns of position. On that day—for England can afford to be just to allies—the French and the Sardinians nobly vindicated the prowess of continental armies. On the 17th of August the fifth bombardment, with 84 mortars and 112 guns, again threw its masses of projectiles into the Russian forts; and on the sixth bombardment, lasting from the 5th to the 8th of September, 91 mortars and 116 guns from the British batteries alone, assisted by 620 guns from the French batteries, crushed Sebastopol beneath that *feu d'enfer*. This hurricane of iron covered the storm and capture of the Malakoff, and the fruitless though obstinate assault of the Redan, and justified the evacuation of the southern city of Sebastopol, by the Russian general. The British batteries expended in the bombardments 85,769 shot, 77,904 shell, and in the siege 253,042 rounds; the French, 1,100,000 rounds.

The Russians fought in the full use and enjoyment of great advantages in an unstinted renewal of men, guns, and stores, and as became the renown which they acquired in 1813 and 1814, and in the earlier battles of the Russian empire, during the revolutionary war. They fought not only with the asssistance of heavy masses, but under the auspices of a genius developed for defence to a point previously unattained. The official plans of the Russian defences surprise the military student, by the proof of a ready skill which placed the works of construction necessary for defence at the precise point threatened, and employed no more labour than was indispensable. There was an economy of labour, of strength, and of material, well deserving the admiration of the scientific soldier. If a parapet only is wanted, there the trace is limited to a parapet; where a battery is needed a battery is placed, but with no more extensive armament than is absolutely necessary. Every fold of ground is taken into account, and to its contour are adapted the scientific rules which teach the engineer

how his defensive precautions may be best conducted. Examine these faces, and it will be seen that the power of enfilade is withdrawn from the attacking force by the prolongations of works invariably falling on inaccessible ground. Now that in the midst of such a sudden and terrible burst of war, with the necessity of improvising the defence of an open town, attention should be given so minutely to these points, argues a well-organised system of scientific training in Russian military education. It infers a great capacity, not only on the part of a chief to devise, but on the part of the subordinates to execute. But while speaking of this we must not forget, that when fair opportunity was given to our scientific soldiers, they embraced it with a skill that left nothing to desire. The lines of defence of Yeni-Kale, and of Kertch, were, under less favourable circumstances, extemporised from the small resources at the command of the engineering officers who traced, and the artillery officers who armed, the works; but with no less accuracy are the indispensable conditions of flanking and direct fire observed.

So ended the Crimean war, and yet not without a noticeable exploit by which the Russian general concluded his protracted defence. His masterly withdrawal of troops and guns across the harbour bridge, stamps him with the impress of that most valuable quality, the habit of considering, not only how troops can be best handled in battle, but how they can be withdrawn, on necessity, with honour and to the preservation of valuable lives and military credit.

But these successes were not achieved without heavy sacrifices of brave men of all ranks. France mourns that gallant marshal, exhausted by African campaigns, with a courage worthy of the best days of chivalry, clinging to his duty in spite of intense bodily pain which bore him down before he let the baton of command glide from his grasp. England mourns foremost amongst her many veterans the loss of that noble soldier spared from the battles of the Peninsula, the companion of the Duke, known in the interval of peace by the attention he gave to all that concerned the welfare of the army. He left this country an aged man, spurning the repose to which his long services had entitled him, when duty called, and because his country felt that there was none so qualified by experience, temper, and character to fill the difficult post of joint leader of an allied force. His country has now reversed its severe and precipitate judgment, as it learned how, month after month, on those bleak downs to which he had led his troops, in obedience not simply to the orders of the Government, but to the demand of the English people, he laboured, through misrepresentation at home and difficulty abroad, like a true christian soldier. Wherefore I would conclude in the words of one who knew him well, who was associated with him in his unceasing toils, and like him exposed to those shafts of obloquy which pierce deep: "In these times of trial he ceased to be equal with other men, for his personal ascendancy gave him a singular faculty of carrying his fixed determination into the minds of those who approached him. Without disregarding facts, he would calmly withhold his assent to all gloomy apprehensions, and mildly force attention to the business in hand; and thus, or rather perhaps by a power which cannot be traced or described in words, he threw upon those who approached

him the spell of his own undaunted nature. Men went to him perturbed and anxious, and they came away firm."

The CHAIRMAN: Ladies and Gentlemen, I am sure you will permit me, on your part, to offer to Colonel Adair your thanks for the Lecture which he has just now delivered, and for the ability with which he has brought his subject before us. I must say that his address is one most admirably suited to us. There are a great number of wars, some of them large, some of them small, but carried out in a distant part of the empire, which have to a very considerable extent escaped the notice of the public from the distance at which those countries are situated, and from the fact that many of them took place long before we had that communication with the distant parts of our empire by steam that we now have, and long before the electric telegraph brought news so quickly to our doors. I am happy to say, that Colonel Adair will continue the subject which he has now introduced to you with such ability on this day three weeks, the 31st of May, and subsequently until he has completed the labours he has laid out for himself.

Friday, May 31st, 1861.

LIEUTENANT-GENERAL E. F. GASCOIGNE in the Chair.

ENGLAND, HER WARS, AND EXPEDITIONS SINCE 1815.

By COLONEL ADAIR, A.D.C. to the Queen.

PART II.

In the present lecture it is proposed to treat of the Colonial wars, of the Cape and New Zealand, the wars of Burmah and China, of the wars which signalised the unwilling resumption of a warlike policy by the government of India, and of some of the lesser operations of our arms therein.

Now in operations conducted on a limited surface, and on the European system of warfare, the general scope is determined by artificial considerations of fortresses, political frontiers, and dynastic combinations. Such was the case during the wars of the French Revolution, with the exceptions of the campaign of the Argonne, under Dumouriez, and of the Bohemian Mountains, in 1813-4. But when the theatre of war is transferred to the vast regions of Africa or of Asia, wherein the combatants pass over wide or desert spaces to meet in fight, with no risk of violating a frontier, and mainly dependent on their own resources in *matériel* and stores, and act on scanty local supplies, natural features determine the strategic design; and, though the base of operations should, as has been seen, lie upon the coast, the line of operations must be determined in subordination to

natural causes, by which science may profit, though it can neither modify or control them. And for analogous reasons the composition of armies designed to war in such regions must vary from those equipped for European service. As the country grows wilder the native irregular rises in importance; the looser formations of desert war are suited to the spirit which abhors regimental discipline, and dreads the monotony of scientific operations. And the experience of the series of wars which are about to be described points mainly to such results, and in none more clearly than in the Kafir wars. It is not easy to convey a correct impression of the scene of these repeated and obstinate struggles. A territory of vast plains and rude hills, more rugged as they recede into the interior of the South African continent, is traversed by rivers falling in parallel but tedious courses within the boundaries of the colony into the Indian Ocean. Each kloof of these hills has been the scene of savage battle; each fort which has been placed to observe the drifts at the river ford has seen the swarming masses of the beleaguering Kafir; every town, hamlet, and missionary station lying beyond the three districts of the original colony has been exposed to inroad, fire, and destruction.

It is through the most rocky passes and most broken ground of this territory that the campaigns of the Kafir wars were carried on. On the occupation of the Cape by the troops of His Majesty, and for many successive years, the natives, and the Dutch settlers, and those who as colonists had followed the fortunes of England from this country, seemed to have lived in a state of tranquillity and good feeling. But in 1817, probably in consequence of the expansion of the colony, that repose was disturbed. On that occasion an irruption took place which was chastised. The country to the Great Fish River was then held by thirty forts, of which a number were distributed along the right bank. In 1819 an attack was made in force on the young colony of which Grahamstown was the capital, by Macomo, and successfully repelled. The frontier was then advanced from the Great Fish River to the Keiskamma. But it was clear that thenceforth the relative position of the colonial power to the native inhabitants would be one of distrust, perhaps of chronic disturbance, as has been subsequently proved. At this very moment the colony is threatened with a border war. It is grievous to learn that after so many years of continued struggle, with such an exercise of forbearance, of conciliation, and also such distinct proof of his armed strength, the colonist should be still exposed to that perturbation and interruption of peaceful pursuits, to avoid which such heavy sacrifices have been made.

With regard to the second Kafir war, of 1834, the physical features of the country, as has been stated, determined the tactics of the campaign. Within the triangle which is included between the Indian Ocean, the Atlantic Ocean, and the Orange River, lie four masses of mountains, the Winterberg, the Sneeuwberg, the Zuurberg, and the Stormberg.

From the north-easternmost of these ranges, the Winterberg, the line of frontier to the sea was simultaneously attacked, on a length of 250 miles, and a depth of 150. The inroads of the Kafirs were principally directed on the flourishing provinces of Albany, Uitenhage, and Somerset, which had long outgrown the original boundary of the colony, and were therefore more liable to attack, as offering a more obvious prey to the

invading Kafir. The Kafirs were driven to the banks of the Kei, and there was peace till 1846. The third Kafir war terminated in 1847 with the cession of additional territory, and again there was peace till 1850, which commenced the struggle concluded in 1853.

It will be now my endeavour to depict the nature of the rugged country through which the Kafir wars have been carried on. To the eastward of the Great Fish River are interposed between that river and the remote frontier the Keiskamma and the Buffalo rivers. This country is of a rugged and difficult character, but, rugged and difficult as it is, it has been penetrated in every direction by the British patrols, in accordance with the only system of warfare available against an irregular enemy, and which in this case was successful in curbing their power, and expelling them beyond the eastern frontier of the colony. Sir Benjamin D'Urban armed the frontier on the Great Fish River with a chain of forts from point to point, in development of the original system on which the country to the interior had been held by thirty posts more or less strongly protected. This policy has been adopted and confirmed by all his military successors. It was needful, however, as the war grew to advance these posts, and a second line of posts from the northwards beyond the Keiskamma, and resting on the fords of the Buffalo River, observed the Kafirs, and gave shelter to the flying colonists, and a base of operations and a depôt to the British detachments. The burgher and colonial levies have fought side by side with the British forces with equal gallantry and distinction. Taken from their shops and peaceful dwellings, they did their duty as became men engaged in defending their homes, while they upheld the credit of the British arms against the inroads of the Kafir tribes. But, whatever preparation was made, however surely the skill of the general, and the obedience, discipline, and true endurance of the soldier, determined the successful issue of the campaign, still it was a laborious and exhausting struggle. Three protracted wars in the dense bush and amid the rugged kloofs, testified how difficult it is to deal with an enemy relying on the natural strength of the fastnesses of his country. For, be it observed, these Kafirs were no despicable enemy. They were men who after their own fashion fought cruelly at times, as is the instinct of savage races, and who made us acquire dearly every foot of territory wrested from them, ever ready to return to the attack on every occasion of vantage, and such warriors are now hanging on the north-eastern frontier of the colony beyond the Kei.

But it was not alone on the old borders of the colony that vigilance was requisite. The South African Boor, the descendant of the original Dutch colonist, is of a powerful frame, of a resolute and jealous nature, not easily submitting himself even to a native government with which he is dissatisfied. It happened, therefore, not long after the passing of the Slave Emancipation Act, and principally in consequence of the change in the relations between master and slave, that a large proportion of the Cape Colony Boors, boldly turning their backs on the comforts and the security of a British settlement, pushed forward into the wild African deserts, like an emigration of an eastern people, with their waggons, their wives, and their children, preferring rather to dwell near and be neighbour to the Zulus and other of the tribes of the north-eastern frontier, and to

seek a new home in a strange land, than to linger under British rule. The fortune of the emigrant Boors was various, but they at length succeeded in establishing a settlement far beyond the Kei, in the neighbourhood of Port Natal. Their position naturally brought them into contact with strange tribes, which, having reason to complain of the treatment they experienced at the hands of the new residents, claimed the protection of the colonial government. That assistance was granted, but the Boors made a resolute and effective defence not easily to be overcome at a distance of 600 miles from the seat of government. Port Natal, on the eastern coast, had been occupied originally by the Boors and offered as a settlement, which, however, the home government refused to accept. But when it became imperative to repress the aggressive action of the Boors on those dependent tribes, a small force was despatched to Port Natal. It was however so unequal to cope with the strength of the Boor emigration, that it was besieged for many weeks in camp, until a maritime expedition enabled the regular troops to resume the operations successfully.

But still that was not the end. In 1848, a year of revolution in Europe, the then leader of the Boors, Pretorius, proclaimed himself chief of an independent republic, and declared war on the colonial government. The late Sir Harry Smith, then commanding at the Cape, engaged him amongst the northern mountain fastnesses, with advantage, and pacified the northern frontier. Such is a general history of the colonial wars which have been carried on at the Cape.

It is a source of inexpressible regret to me that time does not permit me to dwell on the gallant actions, the perseverance, and the endurance shown by our troops on particular occasions during those wars. It is matter of pride to see what noble deeds have been done beyond the Kei by our soldiers in remote lands. No tongue, however gifted with eloquence, can augment honour justly won by British arms; but it is well that it should be remembered that in addition to the soldier's qualities, the humane sentiments are not forgotten in those characteristics that dignify the operations of war. And be it said, to the honour of the British troops, that at no time have the cruelties of the foe led them to adopt reprisals: not even when, in the Kafir war, their officers were surprised, cruelly tortured, and left exposed in the rugged kloof; not in Koorg, when unhappy soldiers, seized from the line of march, were put to death within hearing of their comrades; not when the rafts of the Burmese brought their ghastly freight of crucified soldiers past the lines of our troops. This self-restraint should be known: it is not the least of the proud attributes that belong to our armies.

I am not here to expound a policy, rather to show that a policy has been accomplished which has carried new blessings with it. Wherever throughout the Kafir land the British outposts are planted, there the soil is hallowed and redeemed from the waste by the presence of a missionary chapel. Far as our outposts were pushed into the wild African deserts, further still have courageous, self-denying men, in their Christian warfare, advanced their standard as the emblem of a purer faith amongst the heathen tribes.

The only colonial wars upon which it remains for me to speak are the

first and second wars in New Zealand. In the first war the New Zealand chiefs maintained themselves stoutly; and it is not my purpose to detail the events of those contests, desiring merely to suggest this inference, and to affirm this rule from the colonial campaigns—that while small numbers are aided by the appliances of science, by fortified posts, and the use of artillery, the soldier should be also trained in the spirit of local warfare, in subordination to the rules which science has indicated. For instance, the system of patrols or moveable columns broke up the strength of the Kafir tribes. The New Zealand warfare has been principally carried on by the natives in a well-founded reliance on the strength of the pah; stockaded with great ingenuity, in many cases pierced with bomb-proof subterranean galleries. Now, in the last dispatch from the major-general commanding in New Zealand, it is shewn that he has applied to the repression of the New Zealand insurrection, principles of military art. By a system of redoubt and sap as a base and line of operation, the troops have gradually worked their way into the heart of the enemy's defences, with a success which has justified these applications of science, to combat those modes which the instinctive genius of the savage chiefs had applied in their own fashion.

I pass from the colonial wars to those of Burmah and of China, and to the combined movements of the land and sea forces.

The earliest in date is the first war with Burmah, which commenced in 1824 at Sylhet, within 250 miles of Calcutta. The first war terminated in the accession to our territory of a large extent of the sea-coast of Burmah to the southward; and the acquisitions of the second completed, with but a slight interval of Siamese territory, the circuit of the Western coast of the peninsula from the Straits of Singapore to the port of Kurrachee, girdling the eastern shores of the Indian Ocean and the Bay of Bengal with the settlements and territory of England. Against Sylhet, on provocation given by the Burmese, a double expedition was organised. One army-corps mustered for land service at Dacca, and crossing the Burrampootra advanced to Islamabad, better known by the name of Chittagong, and moved to the south of Arracan and to the pass of Aeng, where it maintained itself till the close of the war. On the march lies a spot hitherto unnoticed, called Ramoo; there a gallant soldier, with a small force, maintained his position most resolutely against the Burmese army, then concentrated under their General Bandoolah on the north-west frontier of their country. Amongst the records of English valour there is no deed that deserves greater notice than the defence of Captain Noton. The combined expedition of land and sea forces, mustering at the Great Andaman, was at once directed on the heart of the enemy's strength. I remarked in my first lecture, that the natural base of operations in English strategy is the sea, and the line of operations is on fluvial districts. This principle governs the Burmese campaign. Rangoon was taken, the stockades of Kemmendine and Kummeroot stormed, an advance made on Donabew, with a flank movement to Bassein, which, though partially delayed, ultimately succeeded in forcing a way upwards to a succession of victories. But not without severe loss and a display of daring and courage on the part of the Burmese were these successes obtained. Rangoon and Kemmendine were invested by the

Burmese, while for several days the enemy were kept at bay only by the resolute countenance and courage of the flotilla acting with the troops and throwing in a flanking fire.

The Burmese fought as they retired with an admirable resolution, but could not check the advance on Prome, nor effect the recapture. Thence in rapid succession the capture of the stockades of Ze-ouke; the victories of Napadi, Meaday, and Patanago; the storm of Melloon; the victory of Pagan-mew, placed the army under Sir Archibald Campbell, always flanked and supported by the exertion of the combined navy of the Crown, and the East India Company at Gandabo, within 50 miles of Ava. There it was ultimately that peace was made. For maritime losses also had broken the obstinacy of the Burmese Court. Martaban had fallen; an expedition to the south-east had bombarded and stormed Merguy, Yeh, and Tavoy. A partial repulse, indeed, had been suffered near Pegu, but was redeemed by the skill of the chief, and courage and discipline of the soldiers. Such was the first Burmese war. It resulted in the accession of a large sea-board to the territory of the East India Company.

The second Burmese war was similar in its incidents, and the long sea-line from Kurrachee to Singapore, with but the exception of the narrow limit of the Siamese sea-coasts, was added to the possessions of the Crown.

The incidents and characteristics of the war were principally those of defence by stockades, conducted with extraordinary tenacity, and in manœuvres to confine the invader within the swamps and forests, in which the pestilential climate might do the work of the sword. Not much was known of the nature of the country; but, the expeditions being conducted on a narrow surface, and the force being concentrated, it was more easy to acquire information with the aid of the navy than subsequently in the Chinese wars.

In China, after a succession of outrages long overlooked, it became evident in 1840 that matters at last were come to a crisis, and, after some slight affairs between the boats of our ships and the enemy in the neighbourhood of Canton, serious and determined action was taken by the unassisted strength of England against the then undivided force of the Chinese empire. Much was still to be learned, and, though it was quite sufficient as an indication of strength that the forts of the Bogue should be captured, it was necessary to know more of the circumstances of the country; and therein the royal navy gave proof of that ready skill in surveying, which was applied to the purposes of the war.

The first war was commenced in 1840 by the capture of Tinghae, the occupation of Chusan, and the blockade of Amoy and Ningpo. Early in 1841, the capture of the Bogue forts and the destruction of the Chinese squadron in Anson's Bay proved the determined policy of England. The battles of Chuenpee and Tycocktow, the storm of Anunghoy and Wangtong, and, as the ships forced their way to Canton, the capture of the Howqua Fort and Fort Napier, and of Motow and of the dependent forts and batteries while forcing the Macao passage with the "Nemesis," showed that the English navy was able to work its way through intricate and heavily defended channels. But the first blow produced, as usual, an offer to treat.

Amongst the services of the navy, the scientific knowledge of the officers was conspicuous. Greater skill in exploring and mapping out water-channels has seldom been exhibited than in the successful result of a survey which was made to the left of the main channel through the Macao passage, up to the walls of Canton, by the "Nemesis." Nor must the successful investment of Canton be forgotten, nor the just forbearance with which the troops were restrained, from considerations of humanity, from consummating by assault the capture of the city, be unrecorded.

But the submission and ransom of Canton were not sufficient warning for the Chinese Government, and so, after fruitless attempts at negotiation on the British part, the expedition passed northward. Amoy bombarded, Kolingsoo taken, Tinghae captured, Chusan re-occupied, Chinhae captured, Ningpo surrendered, Yuyow taken, Chapou stormed, the Woosung batteries silenced, Paoushan and Shanghai occupied, and finally the successful assault of Chinkeangfoo, almost within sight of Nankin, brought the expedition under the walls of the second capital of the Chinese empire. But here, again, the forbearance proper to civilised warfare intervened, and a discreet and humane policy permitted, at the moment of assault, the Imperial Government to ransom Nankin from storm. And so for a time it would seem that friendly negotiations were resumed, but not by the Chinese with a whole heart, for in 1847 Sir John Davis swept the Canton River from the seaboard upwards, making capture of 450 pieces of ordnance, as a warning to the perfidious Government of China.

The "Hermes" in 1853 penetrated to the interior previous to the next struggle, threading its way up to Nankin, and passing between the Imperial and Taeping armies, whose fierce contest had arisen since the British flag last floated in the inner waters of the empire.

Three years' peace ensued, until an outrage, suffered by a British subject in the waters of Canton in 1856, precipitated a war undertaken in concert with French allies. Again, Canton was invested and taken. Again, the British navy vindicated its scientific character in the attack that was led with so much gallantry to the westward of Canton, through unexplored channels, and ended in the capture of Fatshan. It was resolved, after this first success, to strike a yet more decisive blow, and the capture at the mouth of the Peiho of the Taku forts resulted in a treaty. There, again, the forbearance which was exhibited, encouraged a perfidious violation of treaty engagements, which it was sought to enforce by the allied arms, but unsuccessfully, at the mouth of the Peiho.

I pause to remind you that there was one nation whose ships were then lying in those waters, whose seamen did not forget on that disastrous day that, in the plain language of their commodore, "blood was thicker than water." That American officer of the United States navy felt well that the spirit of the American policy, of those who have sprung from these islands, should be as one with our own.

To repair this check, was sent forth the completest expedition that ever left these shores. Equipped with the newest inventions of warfare, employed in a scientific and resolute manner against such a teeming population, the effect of prolonged strife might have been terrible. But the treaty of Pekin proclaimed that the allied forces had at length overcome the stubborn pride which separates the Chinese Government from

the great family of nations; while the destruction of the Summer Palace, proved that England does not allow her soldiers to be treacherously slain unavenged.

In reviewing the maritime expeditions of England, I would speak of scientific services as well as of deeds of arms. There are two classes of expeditions in which the brilliancy of warlike exploit and energy of movement do not combine their stirring impulses with the inducements that excite to the faithful discharge of duty. The African squadron was destined to no transitory purpose, but for the lasting service of humanity, in the repression of the slave trade. The successive Arctic expeditions were sent forth on their perilous duty for the advancement of science, in an endeavour to solve the problem which has now received its solution in the discovery of the North-west Passage. Officers and men have alike shown what discipline can effect. In the one, the brave men who have been taken from that service by sickness and death have not sacrificed those lives in vain; since in the last five years eighty slavers have been captured, and four thousand human beings have been redeemed from the chain and from the lash. And in the other, though we mourn over the fate of the lost veteran and his comrades, yet be it remembered by the sorrowing survivors that, amongst the long roll of British worthies, the names of the Arctic navigators who have given their lives deliberately in so good a cause will not be forgotten; neither will the name of Bellot, the French comrade of their toils.

I pass now to the theatre of the successful and stern warfare of a century —the vast Indian peninsula. It was well said by the late Czar, when he had seen the magnificent troops that do duty round the person of the Sovereign, and who have vindicated their position by gallant actions in all fields, "I wish now to see the regiments who have won your Indian battles." I propose now to dwell on the incidents of the two first wars that broke the long repose of Indian administration in 1816 and 1817.

I would for a moment dwell on the peculiar local features of the peninsula in which those wars were waged, beginning, it may be almost said, from the very centre and root of the Malayan peninsula. With but a slight interval of interposed swamps of the Burrampootra, a long range of mountains in one vast arc girds in the eastern coast of the Bay of Bengal and the Indian plains, until it plunges into the sea in Beloochistan. Previous to the war of Nepâl, the struggles of our rising Indian empire had been confined to the plains, whereon the toils of war, aggravated by climate and position, though formidable, were not so intense as those which awaited the first attempt at mountain warfare in the ranges of Nepâl. From these wide and arid plains, dark passes, held by brave and untameable races, rise into the Indian heavens, higher than any European ranges, on a frontier measured by thousands of miles. Under whatever sovereignty those wild fastnesses be held, from the Burmese hills to the mountains of Affghanistan, and thence to the Cutchi hills and the western passes of the Hala range, throughout these passes the British watchfires have blazed, and the bugle has sounded the British advance till the last ridge was stormed, whence danger of irruption or foray could threaten the low-lying possessions of England.

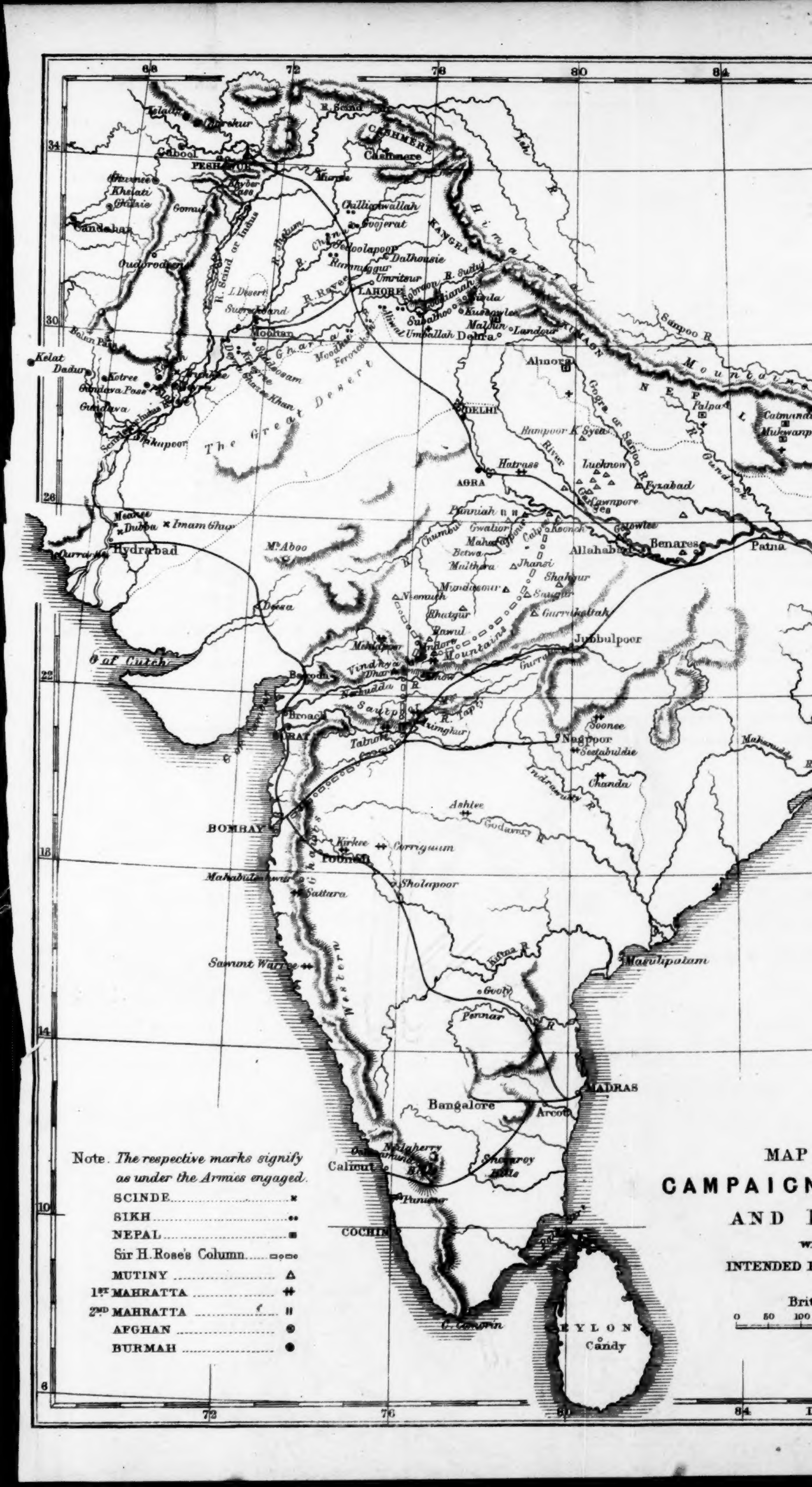
And first of Nepâl. When the first war with Nepâl was determined

upon, the Goorkahs held territory which now lies far within the British frontier near Simla, in the north-west, and thence eastward to the frontier of Sikkim and Bhotân. Four corps were detailed to penetrate into the country. The main body threatened Catmandu, the capital. To the westward of Palpa a second corps kept watch; on the line of Almorah, a third was posted; and on the extreme north-west, amongst the head waters of the Jumna and the Sutlej, rested the force of the soldier who, in a subsequent campaign, prevailed to curb the wild Goorkah. Nor, considering the want of local information, was it surprising that the flank movements to the westward obtained more distinct success than those which were directed by the general in observation of the capital.

It is difficult to convey an idea of the nature of the country through which the decisive movements of Sir David Ochterlony were rewarded by success in several battles, and the capture of Malown. Each rough hill was crowned by fort or stockade or fortified village, and each pass defended by the warlike Goorkahs. Nevertheless, that enterprising general forced these obstacles, and produced, by his successes, in combination with the victory of Almorah, overtures of peace; but, as it happens with Asiatic nations, insincere. In the second Nepâl campaign, Sir David Ochterlony, having the chief command, forced his way through unexplored passes, so little was the country understood, each of which had to be searched and made practicable before it was possible to join battle with the enemy. Nevertheless, Sir David Ochterlony, in the single battle of Mukwanpoor, followed by the capture of Hureehurpoor, closed the campaign, secured a treaty from Nepâl, and left imprinted upon that Government a respect for Britis hpower which has never been effaced. But, while this campaign was thus successfully conducted, a heavier storm was brooding over the plains of Central India. An explosion of the chronic restlessness of the Indian temperament was preparing a series of inroads into the peaceful plains of the Company's territory, by an enemy whose inroads as much exceeded in cruelty and desperate wickedness the terrible devastation of the Carnatic, as their chief was inferior to Hyder Ali in all the warlike qualities proper to the character of an Asiatic.

To the westward of Hoosingabad, there is a ghât descending to the river Nerbudda, and communicating in the interior with a difficult and impenetrable country. This was the camp and refuge of Cheetoo and the Pindaree chiefs, an enemy despicable as soldiers, but formidable as robbers, from their physical powers of endurance, by the rapidity of their marches, and terrible to the peaceful cultivator by the cruelties which accompanied their inroads.

Descending through these passes, and crossing the Nerbudda, 8,000 of these desperate marauders forced their way to the very frontier of the Madras presidency, and, but for an unusual flood of the Kistna, would have penetrated into that territory. Passing thence into the north-west, and returning by the course of the Godavery and the Wurda, they re-crossed the Nerbudda, and, passing up the ghât, rested in security for a time. Another expedition with a more formidable force again passed over the river, and, turning to the south-east, ravaged for twelve days the border provinces of the Madras presidency, and returned again in safety, with the exception of one corps, which was overtaken and destroyed.


MAP
CAMPAIGN
AND
INTENDED
Note. The respective marks signify as under the Armies engaged.
SCINDE ×
SIKH ••
NEPAL ■
Sir H. Rose's Column □○□○
MUTINY △
1ST MAHRATTA #
2ND MAHRATTA ‖
AFGHAN ⊛
BURMAH ●
Cabool
PESHAWUR
Khyber Pass
Candahar
Kelat
Dadur
Bolan Pass
Gundava Pass
Gundava
Mooltan
Shikarpoor
The Great Desert
Meeanee
Dubba
Imam Ghur
Hydrabad
Cashmere
Chillianwallah
Goojerat
Sadoolapoor
Dalhousie
Ramnuggur
Umritsur
LAHORE
Sobraon
Loodianah
Simla
Ferozeshah
Moodkee
Subathoo
Kussowlee
Umballah
Dehra
Landour
Almora
Himalaya Mountains
Sampoo R.
NEPAL
Palpa
Catmandu
DELHI
Rampoor K. Syeta
Lucknow
Fyzabad
Hatrass
AGRA
Cawnpore
Punniah
Gwalior
Maharajpoor
Jhansi
Calpee
Allahabad
Benares
Patna
Mt Aboo
Deesa
Neemuch
Mundisoor
Saugor
Shahgur
Jubbulpoor
Mehidpoor
Mhow
Vindhya Mountains
G. of Cutch
Baroda
Nerbudda
Broach
SURAT
Tapty R.
Satpoora
Soonee
Nagpoor
Seetabuldie
Chanda
Ashtee
Godavery R.
BOMBAY
Kirkee
Corrigaum
Poonah
Sholapoor
Mahabuleshwar
Sattara
Sawunt Warree
Western Ghauts
Kistna R.
Masulipatam
Gooty
Pennar R.
MADRAS
Bangalore
Arcot
Calicut
Neilgherry Hills
Shevaroy Hills
Paniany
COCHIN
C. Comorin
CEYLON
Candy
Brit
0 50 100
68
72
76
80
84
34
30
26
22
18
14
10
6

MAP OF THE

PAIGNS OF INDIA

AND BURMAH

with the

INTENDED RAILWAY ROUTES.

British Miles.

0 50 100 200 300

But, in evidence of the resolute character of these troops, one chief with but 500 horse, turning to the south-west, descended into the plains of the Concan, startled Bombay, ravaged the whole sea-coast through four degrees of latitude, retreating with the loss of half his force, but with much plunder, to Nemawur, the camp of Cheetoo. I know of no expedition comparable to this, except the raid of Gomez, the Carlist partizan, who, from the camp on the Ebro, swept through Spain far to the southward of Madrid, alarming and plundering the country in his career; fighting where strong enough to deal with the Christino detachments, retreating with credit where overmatched. The Pindaree movement was not, however, curbed in a moment.

The Mahratta states, formed from the great Mogul monarchy in its fall, had throughout the Pindaree war also shown discontent, and caused distrust to the British Government. Three armies were originally collected for the purpose of putting down those terrible marauders; but formed also in the spirit of a far-seeing policy, with mature preparation for the field, in anticipation of any eventualities. There were four principal centres of Mahratta discontent, Poonah, Nagpore, Indore, Gwalior, and a subordinate focus of evil in the small state of Sattara. Still an attempt at diplomatic adjustment was made honestly on the part of the Indian government, but the discussions were prolonged in order to gain time on the part of the native rulers. At last, on the Resident at Poonah withdrawing from the capital, the Peishwa moved up his troops, and proceeded to attack British cantonments placed by his own permission for the support of the British Resident. It was evident that the struggle would be severe. Troops were hastily brought up from Bombay, and one regiment, the Bombay Europeans, only halted from the rapid march of 70 miles to fight the battle of Kirkee. The treachery of Poonah was repeated at Nagpore—the same policy, a similar attempt at surprise, no less condign punishment, no inferior display of gallantry on the ridge of Seetabuldee. There was a charge of cavalry given on that day which will be famous so long as a Mahratta horseman lifts lance in central India, known as Fitzgerald's charge, which cleft the Mahratta horse as flame does thread, and decided that famous field, in splendour of promptitude not dissimilar to the charge of the heavy brigade in the early fight of Balaklava.

But in the succeeding war of manœuvre, Poonah, though not threatened, was left unprotected by British troops, except by a weak corps attending the political chief. Turning with the facility with which Asiatic levies change position and evade their pursuers, the Peishwa threatened the capital. The officer commanding sent for reinforcements to Seroor, a distance of 74 miles. The officer in command of the relieving detachment, on arriving at the west ridge that looks down on the plain of Poonah, perceived that between his force of 1100 soldiers and a few guns and the city, lay 20,000 Mahratta horsemen and 8000 of the Arab infantry of the Peishwa. But he, spurning retreat before an Asiatic force, did not hesitate. He intrenched himself in the small village of Corrigaum, and there hour after hour withstood the attacks of these resolute horsemen and stubborn mercenaries, than whom no braver irregulars carry shield and matchlock. At last, weakened by the casualties of so desperate a struggle, and exhausted as his men were in intensest heat, fighting without prepara-

tion, having victoriously withstood the Mahratta onslaught, he withdrew his detachment, and returned into the cantonments that he had left four days previously, bearing back his wounded, his guns, and his honour. Such is the history of the battle of Corrigaum. Then followed important successes,—the surrender of Sattara and the success of Ashtee and of Soonee, the capture of Chanda and the victory of Malligaum, followed by the battle of Mehidpoor, in which the strength of the northern Mahrattas was broken. The surrender of Hatras in the far north-west, of thirty hill-forts in one day, and, finally, that of Asseerghur, closed the first Mahratta war, and terminated for a considerable period the hostile combinations of that military confederacy.

It has been said the distinction between the scientific warfare of Europe and that of Asia is mainly to be found in the tactical employment of infantry, and in the use of siege artillery. Now it will be remarked that the nations that have not this gift of scientific movement with their troops have, nevertheless, very great readiness in the partial management of artillery in the field. They can fight battles of position, but their powers are not remarkable in handling guns for siege purposes; but this should be borne in mind—that in our Indian wars, certainly in all the earlier battles, the field artillery of the British has been inferior to that of the native forces. In the four battles of Assaye, Laswarree, Puthergunge, and Mehidpoor, British artillery were overmatched by native ordnance. This deficiency should always be supplied, as it was in the combats of the Sikh war.

Great sieges have been undertaken with insufficient resources, and consequently great reverses have been sustained. At Kalunga in Nepâl, where General Gillespie fell, and at Kumona, and in the first siege of Bhurtpore, and elsewhere, our siege operations have not been attended with prompt success, in consequence of inadequate equipments. Bhurtpore, in the second siege, was gallantly defended by the Jât tribe, who boasted they had never been conquered. The place was strong in that construction of mud forts so applicable to successful resistance in India. The enemy was of that courage and resolution, that the storming columns detailed, were very nearly one-half of the investing force. Twelve thousand men advanced on the four points of attack, two being open breaches; and with the resolution of the natives massed within the four great divisions of the citadel, the town, the Gopaul Ghur, and a fortified suburb, the struggle might have been prolonged but for the skill of the Indian engineers, who, by exploding a mine of ten thousand pounds of powder, tore a way in the very heart of the defences, though even then four thousand men perished in defence during that storm.

Wars there were, many of a character entitling them to praise for their high scientific arrangement, that have not obtained general notice in the military annals of India: the contest in Sikkim; the war in Coorg, carried on through a wild jungle; the expeditions of Kurnool and of Nuggur; the scientific movements that brought the surrender of Bednore. Then, again, there have been insurrections of the Moplahs, the Khoonds, the Bheels, and the Coles, successfully and permanently put down; and one recent insurrection that is of a very remarkable nature. There still linger in the lower ranges of the Vindhya and of the mountains over-

looking Calcutta the remnants of an original race, known generally through India as Khoonds, and in the latter district as Sonthals. Their territory, the Dameen-i-Koh, extends to within a very short distance of Calcutta, at the base of the western mountains, and northward of the Dammoodah. They are not of the precise type of the hill-people, but yet are a primitive race, not having forsaken the use of the bow and arrow in hunting. They suffered persecution in their approaches towards the civilised boundary, as it happens too often, at the hands of the native money-lenders. An insurrection broke out, which, although trifling, alarmed the inhabitants of Calcutta. The highway of Hindostan, the great trunk road, was threatened by these wild men, armed in their rude fashion, and thus the approaches to the capital of a military empire were threatened by a sudden outbreak of half-equipped wild tribes. The latest reports show that disquiet again prevails through the pergunnahs. How truly do these insurrections warn us that there may be a worm at the root of our strength—that there is no enemy that can be despised—that there is no country apparently so feeble to resist, in which the population should not be thoroughly reconciled to British rule, by the exercise of a just and far-seeing intelligence!

I propose subsequently to notice that long and yet continuous series of campaigns which, beginning with the siege of Herât, terminated only with the pacification of Oudh. These wars are connected by a chain which, though perhaps not susceptible of brief demonstration, is nevertheless coherent in every link. I trust that these thunders of war have cleared the political and moral atmosphere, and that, as the Indian people appreciate the forbearance of the British Government, so also will the British Government remember, that it is a duty to the territories over which they rule, and to independent States, to show how lovely and beautiful a thing the justice of government may become; and I trust also that this wail of anguish which has met our ears from the Indian regions, exhausted by fierce famine, may be the last sound of suffering rising from the plains of Hindostan under British rule.

THE CHAIRMAN: There are times when one would desire to be gifted with eloquence; but, as I do not possess it, I am happy to say on the present occasion it is not necessary. I have to propose the thanks of this meeting to the gallant Colonel for the very able, interesting, instructive, elaborate, and yet perspicuous, account that he has given us of these wars in which the British arms held so distinguished a part—an account evidently showing that he must have been instigated by the deepest love of the service, and that he must have made a careful search into the annals which he has just now briefly, but ably, given to us—a love of the service of which I think I may say we should be proud if we had him as an individual of the service, and thus more permanently employed. And here I will avail myself of the opportunity, if I may be allowed, to say briefly, that I had the honour of having the gallant Colonel under my command when at Colchester, and a more efficient regiment than his, I had not seen during the time that I had a much larger command when in Ireland. It was as you know a scientific corps. He made himself master of the science in a way that was perhaps the most desirable; for he went

to Woolwich, and there endeavoured to obtain, and succeeded in obtaining, a knowledge of that science which we do not find sometimes possessed by officers even in a number of years' service. His regiment, as I have said, was most efficient, and it is a gratification to me exceedingly to find myself in this chair, and to have the opportunity of expressing my acknowledgements of those services. Another circumstance I may be permitted to allude to—the great pleasure I have in seeing some few of our British soldiers in the gallery. I wish there were more, and I trust that, having heard so interesting an account of our wars, they will be induced to lead others to attend. I am persuaded that the more they come here, the more they will be enlightened and the service benefited.

Friday, June 14th, 1861.

Lieutenant-General E. F. GASCOYNE in the Chair.

ENGLAND, HER WARS, AND EXPEDITIONS, SINCE 1815.

By Colonel ADAIR, A.D.C. to the Queen.

PART III.

BEFORE I proceed to the business of the day, I cannot refrain from referring to the report of the proceedings at Melbourne, recorded in this day's paper, on the return of Major-General Pratt from the successful conclusion of the war in New Zealand. This war belongs, in its classification, to the second portion of this course of lectures, and it was therein remarked, that, where the resources of science were employed in conjunction with such a condition of military manœuvre as was appropriate to the character of the country, success would be achieved; and I then pointed out that the Major-General commanding in New Zealand employed the sap and the mine.

From the despatch this day, it would seem that the later operations have been carried on more in front of a resisting fort, than in the face of an enemy in the field. It was an enemy entrenched in the natural fortress of his position. Sap and mine, the artillery fire both from Armstrong guns and vertical, were used to keep down the enterprise of this daring enemy, and with a success which has entitled the Speaker of the House of Representatives in Melbourne, to congratulate Major-General Pratt and his brethren of both services, regular and volunteers, not omitting the naval volunteer colonial service, and thus to include and embrace them all in the thanks which the House of Representatives of the free community of Melbourne have tendered to that General.

I said on the last occasion, that, whereas in Europe artificial position of fortresses, and political conditions, determined many of the operations of

a campaign, on the other hand, in the warfare of Asia, and in remote or barbarous lands, it usually happened that manœuvring and strategy must be governed by the physical features of the country.

Let us then consider what ranges of mountains our troops have scaled; athwart what a spread of plain our columns have marched; over what bridgeless rivers they have passed, guns, cavalry, and infantry; and finally, from what remote distances combined plans of movement were arranged—at a greater disadvantage, and with longer radii of concentration, in order to the final suppression of the Indian mutiny, than have been known in any of the famous wars of Europe.

The Indian wars, from the first fanning of the spark at Herât to the final pacification of the mutiny in Oude, all have a distinct, regular, and consecutive relation. At Herât, the difficulties arising from diplomatic ambition, the rumours current in the central states, lying between the two great European conquerors of Asia—the Russian and British—had so complicated the relative position of the native powers, that the crisis was precipitated in the four months' siege of Herât, under Russian inspiration, and with the presence of a Russian general in the camp, and by the avowedly open but independent defence of the city by the successful efforts of a subaltern officer of Indian engineers. That warning was not to be neglected. From that warning resulted the operations of the Affghan war. And here I beg to repeat what I have said on a former occasion, that it is not my duty now, on referring to those wars, to vindicate and defend, or even to make clear, the policy of the Government. My object is purely of a military character. I may repeat also, that, in my design rather to explain the sequence of British war than as a military critic, it is not my purpose to dwell specially upon the deeds of those who have conducted campaigns to a successful issue, unless where death has consummated a long period of service, or signalized some act of devotion.

When the first Affghan war was determined upon, the unbroken power of the great Sikh military empire lay between the north-western frontier of India and the hills among which our warfare was destined to be waged. It was necessary, therefore, to avoid the difficulties of crossing the neutral territory of the Punjaub, and thus advance into the Affghan hills from the southward. This long range of mountains, stretching from the Kohistan, on the northward of the Cabul river, to the frontier of Beloochistan, and almost to the waters of the Indian Ocean, is accessible by three principal passes—the Kyber to the north, the Bolan to the south, and the Gomul intermediate, of which the Kyber was barred to us at that time by the diplomatic necessity of respecting the territories of the Sikh ruler, and therefore did not enter into the plan of campaign. There is another pass to the south of the Bolan, the pass of Gundava, which was included in the line of operations. It was determined that the Bengal army assembled at Shikarpoor should march to the northward through the Bolan pass, and that the army of Bombay, landing at Kurrachee, should advance northward through the Gundava pass. From some unexplained reason the Bombay column was obliged to take the Bolan or northernmost, and thus the Bengal and Bombay columns arrived very nearly simultaneously on the scene of their first triumphs. Khelât-i-Ghilzie fell; Candahar surrendered; Ghuznee, in default of siege artillery, was stormed, the gates having

been blown in by the happy inspiration of an officer of Indian engineers; and our troops concentrated around Cabul seemed to have achieved the policy of the government with but little loss.

But in the occupied territory symptoms of disorder speedily manifested themselves. First it was necessary to punish the Khan of Khelat; then, on the manifestation of the usual uneasiness and disquiet common in India when war is afoot, it was imperative to subdue the territory which lay beyond the line of our advance. The troops left in Affghanistan were stationed at Cabul, Candahar, Ghuznee, and Khelat-i-Ghilzie. The district that caused this disquiet was that which, lying among the hills of Upper Scinde and of the Beloochees, is held by fierce and war-like tribes—the Murree, the Booghtee, the Jekrani, and Doomki septs, and many others, of which the four principal could bring ten thousand fighting men, warriors such as Asia cannot surpass, into the field. These tribes, like the military castes and classes scattered throughout Asia, who look upon war as their trade, and the country as their prey, were disquieted at the approach of a government which enforced the regular observance of the law. Therefore it was that in 1839 and 1840 the campaigns of Upper Scinde and of the Cutchi Hills were undertaken. The district is rough, the towns are of considerable strength, and defended by those who are well acquainted with the advantage of the system on which their warfare most thoroughly harasses European troops fighting on European tactics.

Amongst these hills Kahan was occupied, and became the seat of a most gallant defence. But, notwithstanding these successes, it appeared evident from the circumstances of the country, and the difficulty of bringing up reinforcements after a long and gallant defence—one of the most gallant defences made in our Indian wars—that Kahan must be evacuated. Dadur was also evacuated, Kotree held in force, and Khelat evacuated and re-occupied by the British general. And so, with skirmish and reverse, the war wore on, till at last the Khan of Khelat was defeated in the Gundava pass by the commandant of Kotree, and the wild tribes, entering into alliance, confessed the supremacy of our arms. Thus closed the Biluchi and Brahoi campaign.

But before the story of these campaigns is closed there is another tale to be told, exemplifying what brave men can effect under unexampled difficulties—a tale of endurance, of courage, of hoping against hope, which cannot fail to be memorable to all time in the military history of England. It soon appeared clear that the sovereign whom we had placed on the throne of Cabul held it by an insecure tenure. Early in the October of the year which witnessed the disasters of Cabul, Sir Robert Sale had been sent forth to clear the first of that succession of mountain passes through which the communication with the plains of India by Peshawur is maintained. Eighteen days of hard fighting in the month of October, when the snows were descending on the passes, and had clothed the hills, were consumed in forcing the Khoord Cabul and the lower passes. Passing thence through the Tazeen valley and the Gundamuck pass, Sir Robert Sale established his winter quarters at Jellalabad.

The insurrection of Cabul broke out, the massacre of the retreating army followed, and at length one solitary horseman was seen to alight at

the gate of Jellalabad, the sole remnant of the noble force which had lain in the cantonments around the capital in its strength and pride. But in no wise did Sir Robert Sale and the 13th regiment, and their comrades of all arms and services, British and Indian, abate their firm reliance.

Jellalabad, abandoned by its Affghan rulers as a residence, was weakly surrounded, scarcely fortified, by ramparts, which had become by length of time so degraded that over the very walls led cartways from the country into the city. There were men however within those walls who were competent to hold them against sedition within and an armed force without. Separated from India by the Ghilzie tribes of the lower passes and the inclemency of the season, the bones of a British army bleaching in their front, they lost neither heart nor hope. The fortifications rose rapidly under the cheerful labour of that resolute garrison. From time to time the half rations with which they cheerfully supported the consequences of a prolonged blockade were amended by foraging parties, which their lively courage sent forth into the plains amongst the Affghans; and, although at the completion and in the very fulness of their preparations the powers of nature seemed to combine with the powers of man against them, shaking down bastion and tower, and ruining their batteries, yet there was not one word of surrender. Not for one moment did the veteran chief, whose family were then prisoners in the wild, forget the noble counsel that had been given by the illustrious woman who shared his fortunes. Noble indeed was the counsel that that heroic woman from her mountain prison gave her husband, "Never to yield."

And so relief came eventually, as it but rarely fails to those who have watched. Though Wilde was unable to force his way upwards from Peshawur, Pollock was on the march. Nott, from his fortress in Candahar, harassed the Affghans with his continual demonstrations, and smote them with one sore defeat. Khelât-i-Ghilzie was held successfully; Ghuznee had been surrendered, and was yet to be recovered. But soon Nott, by the northern pass, Pollock and Sale from the south, hurrying on their way to Cabul, joined with the garrison of Jellalabad, and overthrew Akhbar Khan in the fight of the Tazeen Valley, and under the walls of Cabul; Ghuznee was recovered, and that band of captive women, children, and hostages was rescued from a threatened captivity in Central Asia, beyond the Oxus, and restored to the country of which they had by their patience and nobility of spirit deserved so well.

The disasters of the Affghan campaign having been redeemed on the spot on which they had been endured, the army returned to India, to await and to find other opportunities for the exercise of its prowess.

The difficulties that beset the administration of the British government to the western side of the Indus and of the great desert of Scinde had not yet exhausted their evil influences.

The Ameers of Scinde, established as successful invaders of the country which they occupied, had for a long time supported their power by the assistance of the hired swordsmen of the Biluchi hills and of other mercenary warriors. Sir Charles Napier, with that active desire to benefit by civil progress, as well as to protect by military strength, the provinces entrusted to his care, of which he had shown so noble an example during his employment in the Mediterranean, determined

to bridle not only the wild hill-men, but also the Ameers, and to overawe the strong cities of the plain.

With a rare and fortunate perspicacity he perceived that there are occasions in which the civil chief and the great ruler may combine the qualities that belong to the adventurous soldier. He undertook without hesitation, he perfected without accident, winning thereby the calculated and deserved praises of the Duke of Wellington, an inroad into the heart of this desert of Scinde, the like of which has scarcely been known in Asia. Amongst the disputes awaiting his decision he found that which pertains to a disputed succession, and, in vindication of our ally, he pursued into the heart of that desert to the famous fortress of Imâm-Ghur, which no European had ever visited, the flying chief who evaded the authority of the British government. For eighteen days, with a picked and resolute band, did that chivalrous leader traverse the desert, and with deserved success. The fort of Imâm-Ghur was blown up, and the echoes resounding through the hill country told the tribes what manner of ruler there was, both for the field and the durbar. But with the Ameers of Scinde a sterner and more desperate contest was held. The battles of Meanee and of Dubba, fought under the walls of the capital, consummated the conquest which had been provoked by their own attack upon our Resident in Hyderabad, and reproduced once again the oft-told tale of British conquest—a residency is attacked, and a kingdom is annexed. It is the same story of a resolute resistance in defence of a kingdom, the same story of masses of cavalry driven into rout, and heavy guns in position carried by the strength of the British infantry, happily, also, of the substitution for the grinding rajah and for the glittering durbar, of the civil servant administering justice in the cutchery.

But this labour, with a rare fortune, was to be mated with an adventure of war equally well conceived, and no less complete in achievement.

Amongst the fastnesses of the hills which shelter the robber races of Upper Scinde, a mass of crags winds, fold within fold, in rocky and inaccessible intricacy,—known throughout Asia as the inexpugnable retreat of the neighbouring tribes,—its mysterious strength giving a rare interest to each tale that told of the labyrinth of remote Trukkee. But robber-chief and robber-hold were about to feel the gripe and receive the soldiers of the undaunted Napier.

Marching from Shikarpoor in four columns, of which one was composed of temporising allies, and overthrowing the hill-men in the plain of Ooch, the Trukkee was invested; but neither natural pass opened the road to the assailant, nor did artifice of war appear to bar the entrance with work or rampart. Following a party of retiring cavalry, the General by chance pressed into the closely enfolded pass, within which clustered the hill-men like hornets in their rocky cells. The way was felt by a partial attack, where a sergeant and eighteen soldiers of the 13th Jellalabad fell with the calmness of Sale's veterans, and honour from the enemy who slew them. There is a custom with the hill-men, that, when a great champion dies in battle, his comrades, after stripping his body, tie a red or green thread round his right or left wrist, according to the greatness of his exploit, the red being most honourable. Here those brave warriors stripped the British dead, and cast the bodies forth; but with this testimony of their own chi-

valric sense of honour, and the greatness of the fallen soldiers' courage—each body had a red thread on both wrists.

After a campaign of 54 days, the principal chiefs surrendered, moved principally thereto, as they affirmed, by the honourable treatment their women had received at Ooch.

Then again, for the time, to the westward of the Indus there was peace; but in the district which had supplied at all times the materials for Indian war, on the northern frontiers of the Mahratta country, battles were to be once more fought, to signalize British power. The Governor-general in person saw the destruction of the forces of Scindia at Maharajpoor, while on the same day the victory of Punniar consummated the destruction of the Mahratta rule. But the favourable terms that were given by the Governor-general to the government which he had stricken down, kept the Maharajah Scindia "faithful amongst the faithless" when the heavy storm of mutiny broke upon us. If vindication or justification of war be required, surely it is found when the conquered becomes the friend and the ally of the conqueror. But on such feats of arms as these we cannot linger, for it is almost impossible to select those which were the most brilliant and most deserving of remark.

So for a time peace again prevailed. Then, as of old, the tendencies of those charged with the administration of the government throughout its dependencies, and especially the disposition of the veteran general who was at that time charged with the whole responsibility of our Indian empire, was for an honourable peace. He knew, in the spirit of English policy, that war is an evil—at best bearable—always, if possible, to be avoided. I spoke of the vast army that, by the forecast of Runjeet Singh, had been assembled in the country of the five rivers, the Punjaub. This army had recently received, as it is believed, considerable accessions from those who, fleeing from the fields of Maharajpoor and of Punniar, discovered that there was no occupation for them as before under the Mahratta standard. Runjeet Singh, a great soldier, a great administrator, resolute as an Asiatic leader, thoroughly understanding his people, moulded and restrained the wildest mass of disciplined soldiers that India had ever seen, trained in the appliances of European skill by veteran officers of the Emperor Napoleon, furnished with a most formidable artillery, which they handled with European exactness. So long as that firm hand held the reins, so long the Sutlej and the Indus marked the boundaries of the Sikh territory. But it was clear that the soldiers had become masters of their generals, as well as the ruling power in the State. Insubordination was manifesting itself amongst the Sikh troops, and, as it was forcibly expressed, it was determined at last in the Sikh durbar to avoid the sack of Lahore by the chance of the plunder of Delhi. In the previous year the Sikhs had made demonstrations along the Sutlej, but which the wise, sagacious, and forbearing policy of the Governor-General had overlooked as a cause of offence, though with a heedful regard to the purport of such menacing indications. But in that sagacious mind dwelt the knowledge which prepares for war, without giving the occasion for it; and the time came at length when that patience was to be vindicated. First of all, be it noticed with what ready alacrity the preparations were made for the struggle impending on the Sutlej frontier. In eighteen months the

infantry and the cavalry of the line of the Sutlej, or rather of the troops massed in rear of the line of the Sutlej, was raised from 13,000 to 32,000 men, 20 guns were added to the field artillery, and a large park of 24-pounders equipped.

Determined not to provoke strife, the Governor-General took counsel that the Indian Government should not take harm, when the news came that the Sikh regiments, breaking up from Lahore, were pouring down in predatory fashion, though with the appliances and the arms of discipline, on the open frontier of Hindostan to the north-west. Government was not taken unawares. Troops had been massed at Umballah. Ferozepore, placed under the command of Sir John Littler, received as much protection as weak entrenchments and almost open lines could afford; for, although it had been evident to military foresight that Ferozepore, projected thus in advance of the great cantonments of Upper Hindostan, must necessarily be exposed to the full weight of Sikh invasion, yet time had been wanting to complete the lines and works which should have made it a citadel of our strength.

The Sikhs came down on the Sutlej on the 13th of December. On the 18th the first battle was fought—the battle of Moodkee. One hundred and eighty miles of the Indian plain had in those few days been traversed by an army ready to meet, and able to drive back, the invading Sikh. There was no want of preparation in the forces which were then assembled to meet this inroad. Two days later, the fight at Ferozeshah shows again how well these troops were competent to undertake the duty of meeting this most formidable enemy.

A movement of extreme skill enabled a small portion of Sir John Littler's forces to hold in check 30,000 Sikhs, and to join his chief when the great battle was to be fought; and so thorough and complete was the destruction of that force, so utter their rout—only paralleled by the great defeat of the Mahratta at Deeg—that it was not till the middle of January, at Aliwal, that they were again enabled to make head against the British forces.

Now, I have had occasion—indeed, I have esteemed it my special duty, not speaking as a military critic, but in some degree as an historian—to call attention to the chief quality of the British soldier, in which he is excelled by none—the quality also which is communicated to the soldiers trained under the British flag—that of persevering endurance, which accepts no defeat, and is powerful in rebound to convert a check into success.

Moodkee having been fought, the next advance was on Ferozeshah, the scene of one of the sternest of our fights, where the ground had been prepared for the battle. In the very core of the Sikh position, surrounded by the heavy artillery which they had brought in such profusion into the field, was the fortified village of Ferozeshah; and against the lines of their entrenchments and their fortified keep, without hesitation, but unfortunately, from the circumstance of a long march, late in the day, the British power was launched. Perhaps it is not without its advantage, and certainly not without its reward in the grateful notice of history, that this very circumstance of that combat showed with how true a constancy British soldiers can fight. There has been no fight nearly resembling that

of Ferozeshah since the great fight of Agincourt. With Agincourt there is a marvellous similarity indeed: at Agincourt, passing amongst the soldiers beside the watchfires, the military and civil chief of the English people spent the night, waiting but for the day to lead his soldiers against the enemy. Threading in the darkness the columns resting in bivouac beside watchfires whose smoke mingled with the war-cloud of the Sikh batteries, whose guns ere dawn broke the murmuring silence of the troops, the civil and military chiefs of India that night passed their hours not of rest, but of encouragement, among their British soldiers. Such a sight was never seen before in India. It is well that such a sight was seen then, to show what is the strength of England. So resolute was the countenance of the soldier—so ardent after those two days of exhausting fight to advance again upon the enemy—that it was the duty of the general commanding in chief, and of the Governor-General, his comrade of the Peninsula, the soldier of Albuera, to place themselves at dawn in front of the impetuous soldiers, in order to that steady advance which overbears all the efforts of an irregular daring. And so the contest of the previous day, which had been fought on such favourable terms for the Sikhs—the weary watches of that night—the words of encouragement and the daring guidance—were not wasted. Early dawn saw those troops on their advance. Early morning saw the encampment cleared of the Sikhs, and Tej Singh in full retreat, with a vain menace to Ferozeshah. Once again, from beyond the frontier, the Sikh returned to the battle of Aliwal, there to meet with a third defeat, to be consummated in the entrenchments of Sobraon. The defeat which Moodkee had begun, and Ferozeshah and Aliwal confirmed, Sobraon consummated. Within sixty days from the commencement of the campaign the troops from Umballah dictated peace under the walls of Lahore, and the first Sikh war was finished by a treaty which gave them peace under the rule of a native prince. But, notwithstanding the care that had been taken to remove from the minds of the rulers of Lahore every suspicion of an ambitious policy, the plague-spot was too deeply ingrained, for the native Durbar to retain independent and honourable connection with the British government. The revolt of Mooltan first gave notice that war a second time threatened the Punjaub. Fortunately, at that time, government was administered by a man who understood the character of the people. Time was given for the approach of the regular forces under General Whish; while the storm of Dera-Ghazee-Khan, the two battles of Suddoosâm and Kineyree, which were fought by the native troops under the command of Lieutenant Edwardes, and by General Cortlandt, prepared for the great siege which was then laid to the stronghold of Moolraj. A portion of the Sikh forces was attached to the British camp during the siege. Their defection under Shere Singh led to the inevitable suspension of the first siege of Mooltan; while Shere Singh betook himself northward to the district lying between the Jhelum, the Sutlej, and the Chenab, and applied his art to fan the smouldering embers of strife. The second siege of Mooltan was then resumed with vigour, the battle of Sooruj Koond restored the credit of our arms, and ere long the capture of Mooltan avenged the murder of our countrymen, with which the insurrection commenced, in prophetic warning of its deadly character. The bombardment was probably the heaviest experienced in India: 13,000

round shot, and 26,000 shell, heaped the city in ruins above the heads of its defenders and its inhabitants. Through the breach of that conquered city, in just vindication and acknowledgment of their public services, of their heroic death, and of the treachery by which their fate had been compassed—were borne the coffins of Vans Agnew and Anderson, and interred, in honour and under salute, on the highest point of the citadel.

There still remained the force under Shere Singh to the northward, where his levies were mustering. Four battles in quick succession testified to our perseverance; and though the courage, to which full compensation of victory was denied at Ramnuggur, received its reward at Sedoolapoor, it yet required the crowning fights of Chillianwallah and of Goozerat to complete the policy of the war. And in these battles, it will be remarked, that which had caused serious loss to us in earlier battles, the disproportion of British artillery to the artillery of the native forces, was removed. Of Goozerat, especially and prominently an artillery battle, it may be said that it is only paralleled in the duel between the French and Austrian artillery, in the movement of Napoleon with 100 guns at Wagram. Chillianwallah stamped again the character of endurance on the troops engaged. Fought in a thick jungle which rendered manœuvres impracticable, nevertheless, the British soldiers did not falter. A remarkable incident occurred during this battle. It was necessary to bring round a brigade of the Bengal artillery to the proper right of the Sikhs, who had expected an attack on that flank, and had laid their guns for 700 yards. The officer in command, with instinctive energy and daring, did not unlimber till within 300 yards of the Sikh gunners. In one round the brigade was so completely shrouded in smoke, that the Sikhs could never correct their aim, and the only casualties arose from musketry fire. That soldier was one of the earliest victims to the disease, which in six weeks struck down so many of the British chiefs in the mutiny. I speak of Colonel Mowatt.

War, though appalling in details, even when unexampled in successful completeness, is not without instruction, and therefore not without encouragement, to those who ponder its lessons well. No great event occurs without warning. Some unnoted chain of causes will be found to have conduced to a result startling to those who have been blind, heedless, or supine. The mutiny of 1824 was promptly repressed by Sir Edward Paget. The warning that had been given in the Gwalior campaign, of the mutinous feeling of some regiments even then, the disaffection of some Bengal regiments in Upper Scinde in 1845, together with the uneasiness which had been felt, if not openly proclaimed, by those best competent to judge of the Indian soldier, showed clearly that on some unfortunate conjuncture those embers of mutiny would burst into flame. And, when the Mutiny burst forth at last, it was with the sudden rise and devastating sweep of the Ganges in flood; and their astounded chiefs recognised the foremost of the revolters in the soldiers of that native army from which special and faithful service might be claimed.

The treason was first nourished, not amongst discontented Mahrattas, nor the Arab mercenaries of the native courts, but within the British lines.

At the reconstitution of the Indian army under Lord Clive, his handful of heroes were aided by the physical strength and courage of

the Bengal Sepoy, as was shown at the victory of Plassy and the storm of Wandewash. The Bengal Sepoy had formed the chief strength of the army of India for many years. The Bombay and the Madras armies, governed under different regulations, and happily by a sterner discipline, emulated the deeds of their comrades in the Bengal service; and that army had achieved a just renown, whence sprung up the greater horror and resentment that this mightiest of mutinies should have been planned amongst the trusted descendants of the soldiers on whose bayonets the power of England in India was first raised aloft. Thus the inquietude that had been waiting upon the military system of India, was at length revealed in universal mutiny. From one border of Hindostan proper, that is to say of India north of the Nerbudda, to the other, spread the revolt; almost, it would seem, by concert, so short were the intervals of time at which the conflagration burst out on points widely separated. Barrackpore and Burrampore terrified the capital: Meerut and Delhi astonished the north-west: Benares and Allahabad startled the central valley of the Ganges; while between the Jumna and the Nerbudda, the contingents of Gwalior and of Indore, and the soldiers of the smaller Mahratta states, showed how prepared they were to take advantage of the impending confusion.

It is not easy to select the special points in this complicated and wondrous strife. But the series of campaigns and of battles of the Mutiny may be distributed under four principal heads. The first campaign is that of the north-western provinces, of which the main feature is the siege of Delhi. The movements for the relief of Lucknow and Cawnpore distinguish the second campaign. The third comprehended the district of Southern Hindostan, or the Mahratta country, from the Nerbudda northwards to Calpee, in which the army of Saugor is the prominent agent. And the campaign of manœuvre and rare combinations by which the mutiny in Oudh was finally suppressed, forms the fourth act of this great drama.

First of Meerut and Delhi. The north-west provinces in these times, one might have said, were especially exposed to the risk of allies flocking to the Mutineers amongst the hill tribes and peoples of the plain of the Punjanb. On the north-west and west were those gallant Sikhs, who had but recently received a decisive lesson from the British arms; bordering on our south-western territory were the ill-reconciled native rajahs; and to the northward again were tribes prompt to descend from their fastnesses, which might have been easily combined in a converging movement upon the plain country. But the genius that presided over the administration of these provinces furnished men of a stamp equal to deal with the great occasion—competent to weld into instruments of British power the fragments which they had scattered so rudely broken on many fields. Without hesitation or pause, the forces from the north-west took up their position on that open ridge of Delhi, there to abide, without help from the lower provinces or from England, till they quartered in the palace of the Mogul. The reduction of Delhi—for technically it cannot be called a siege, except as we speak of the siege of Sebastopol—was a great feat of arms.

The circumstances were alike in an extraordinary degree. In both operations an unfailing supply of arms and of ammunition to the gar-

rison; in both an unexhausted influx of trained soldiers; in both a facility of exchanging the garrison, or sending the sick to the rear, and of introducing stores for their sustentation; and in both, an unimpeded communication with the open country and the districts from which the strength of the garrison was to be renewed. In the heat of an Indian summer, when even the riders of the Carnatic and the best Arab troops of the native princes abstain from warfare, there the British soldier, with his native allies, better hardened than he to the climate, maintained himself in tents, with the thermometer at 125°, in front of an enemy whose obstinacy fortunately was not combined with such an amount of scientific skill as might have been expected from their training, but the very weight of whose attacks was well nigh sufficient to have borne the steadiest troops backwards over the ridge. But not alone beneath the walls of Delhi was that struggle maintained with honour in the north-west. Within the province, each of those civil servants, whose days had been passed in the administration of justice, was to be found at his post, also showing with how much military skill, those who are rightly trained in the hardihood that makes the civilised man the most complete specimen of his race, may be imbued. Bravely those men upheld the credit and military renown of their race. As volunteers they received the thanks of Lord Clyde after the relief of Lucknow, where they showed that, when the soldiers were overpowered and harassed by the weight of their duties, they were ever ready to assist in such extremity with enduring and ready zeal. To go into the minuter conditions of this strife would be tedious. But the calm skill, shown in the disarmament of Mean Meer and Mooltan, and especially of Peshawur and of Lahore, relieved to a great extent from the weight of mutinous regiments the forces in observation at Delhi. After twenty-five assaults made by the mutineers and repulsed, "though Central India was in revolt, though the Gwalior Contingent was in open mutiny, though the insurgents held Rohilcund and Oudh, though to the eastward from Meerut to Allahabad the country was lost, and the English raj was supreme but in the fortress of Agra high above the plain; and in the arsenal of Allahabad, in the doomed entrenchments of Cawnpore, and the Residency of Lucknow, yet from Ferozepore and Loodianah to Meerut and Delhi the Punjaub was safe." At last the hour arrived for the storm of Delhi, and the explosion of the great magazine, which had been effected by the cool courage of Willoughby and his comrades, found a late echo in the concussion which after a four months' siege levelled the barriers of the Cashmere Gate. But Delhi, though captured was not subdued, until six days of street fighting were crowned with possession of the rebellious city, which had already cost the lives of two commanders-in-chief and of hundreds of willing soldiers.

The campaign of Delhi being closed, a portion of the forces was detached, waiting no peace, seeking for no relaxation, prompt to encounter the mutinous regiments wherever they might be found, to the southward. The battle of Agra, under Colonel Greathead, overthrew the rebels of Malwa and Rohilcund.

The tale of the sufferings of the garrisons of Cawnpore and Lucknow stirred England to its depths—it will stir English hearts through all time. It is not possible to realise the extremities to which our noble country-

women and countrymen and their handful of faithful native soldiers in Lucknow were reduced. Three weeks of continual cannonade, poured over and through the breastworks of a weak entrenchment, did not break down the resolute spirit of those Cawnpore martyrs; nor was it till the faith which, with generous confidence, had been placed in the words and promises of one, who had been trained in the society and companionship of his English rulers, had been fatally abused, that there was any thought of surrendering one foot of these weak and open entrenchments. Of Cawnpore we may say no more; but, when England requires a striking instance of devotion, she will look there, and she will look there with the proud feeling that characterises a country looking on the sacrifices of her children, with the sympathy which bewails their unhappy lot. Lucknow, with greater fortune, maintained the struggle. The battle of Chinhut, in which a retreat was inevitable from the defection of the native forces, nevertheless consolidated within the walls of the Residency the resistance which, through five months of siege, was, after long watching, compensated by the victorious entry of the relieving forces into the city. But it was a long and trying delay, although it was perceived that Lucknow, for its steadfast countenance, deserved to be speedily and effectually relieved. With troops coming up from the eastward, from Benares pacified, from Allahabad recovered, Havelock and his glorious bands set forth in their never-wearying march upwards to the residency of Lucknow. Eleven battles, fought in this pestilent season, when heat alternated with rain, through the swamps, placed him at length at Lucknow. The manœuvres of the campaign were remarkable for tactical skill, and were avowedly based on the movements of Leuthen. Hence great economy of life to his soldiers and assured success. The fight of Futtehpore; the success of Aong; the battle of Pandoo-Nuddee; the passage of the Ganges, swollen with the rains, to fight the rebels of Cawnpore; the battle of Busseerut-Gunge; the troops withdrawn, and another battle of Busseerut-Gunge fought; and yet a third engagement at Busseerut-Gunge; then, recrossing the Ganges, the battle of Bhitoor, and the subsequent passage of the troops again into Oudh to fight at Mungalwar,—this weary length of operations, after eleven terrible battles, resulted in the capture of the Alumbagh and the relief of the Residency. But there was no return along the path which he had hewn through the living masses of the mutineers. He was now to accept the condition of a beleaguered general. But help was at hand; the relieving force, strengthened by the converging columns from Delhi and from Saugor, was on its way, though that way lay through the stronghold of the mutineers—through works constructed with wonderful accuracy and much expense of labour—the campaign of Lucknow was consummated by a masterly withdrawal of the garrison and non-combatants from the city, to return to the country which had mourned for them as for the dead.

Meanwhile, beyond the Jumna, mutiny of a no less formidable cast had shown itself on the southern division of Hindostan. The Mahratta was again unchained. The army of Bombay passed northward to the relief of Mhow, through the Ghâts, down which the troopers of Cheetoo had hurried forty years before. The siege and capture

of Dhar; the battles of Rawul and Mundasoore; the relief of Neemuch; the capture of Rhatgur and of Gurrakotta; the battle of the relief of Saugor; the splendid manœuvring that carried the troops through the Mundapore and Malthon passes; the capture of Chaudaree; the storm and capture of Jhansi; the battles of the Betwa and of Koonch; the destruction of Hurdoo; the fight of Golowlee; the bombardment and surrender of Calpee—finally brought the forces of Central India to the walls of Gwalior, and restored the Maharajah to the throne of his family.

But the parallel of the second Mahratta war was not exhausted by the general revolt of the Mahratta race, especially of the Gwalior contingent. But a short period, and through the same country which had sheltered the murderous Pindaree in 1807, Tantia Topee eluded for months the hot pursuit of Parke's partisans. From the ghâts of the Nerbudda, across the plain of Mehidpoor, to the very edge of the dread Scinde desert, back through Bhopal, and so onward to Seronge, that fugitive wandered. At the last, treachery cut short the prolonged retreat which this leader had organized, and Tantia Topee fell into the hands of the troops. Rao Sahib and Feruz Shah of Delhi shared the fate of the broken leaders of the Indian revolt. And, under British officers, the new levies did their duty well. Witness the gallantry of the Sikhs at Lucknow, and of the Biluchi battalion, hurled against the ramparts of Rampoor Kussiah, when stormed by Wetherall's brigade.*

And now the tiger was in the toils. Hindostan was cleared of the mutineers, except in that district whence the rebel's power had drawn its principal strength, and into whose borders it was hunted home, like the monster of its own jungles, and exterminated.

Retiring from the relief of Lucknow, Sir Colin Campbell defeated the Gwalior contingent at Cawnpore, mustered troops at Futtehghur, and prepared with a patient sagacity for the final operations which terminated the Indian mutiny. The objective points were Fyzabad and Lucknow. The manœuvres of this campaign are indeed of extreme interest. It is a strategic axiom not to be neglected without risk, that communications must not be interrupted between columns parallel or converging, by the interposition of an enemy who in a single body maintains the communications unbroken through the component corps. It consists with strategic talent to select the occasions in which this rule may be disregarded. In the condition of Rohilcund and of Oudh, occupied by mutineers, it was necessary to depart from this rule. And the manœuvring forces were posted thus:—To the north-west Walpole's corps was disposed in Rohilcund, moving on Shajehanpore, to cut off communication between the Rohillas and Oudh, while a corps from Meerut marched against the Rohillas. The district lying between the Sae and the Ganges was observed by Wetherall's brigade. The storm of Rampoor-Kussiah, and the capture of the abundant stores and ammunition of this arsenal, distinguished the services of this corps, whose numbers were inferior to the garrison. Such is the power of scientific war! From the south-east the columns from Jaunpore and Azimghur, with the Naval Brigade, which had contributed so materially to the success of this campaign, and a

* From information obtained subsequently to the delivery of the Lecture.—A. S. A.

Ghoorka force from Goruckpoor, pressed the rebels heavily; while the main force, advancing into the centre of the country, captured Lucknow, and commenced that series of operations which finally penetrated every jungle of Oudh and Rohilcund. Although the great object of these movements was to put down a military mutiny, a vast and exceeding benefit was effected by the movements of the columns which rooted out from plain and jungle the bands of robber chiefs who had established themselves therein after a fashion the like of which has not been seen in Europe since the middle ages. In these dense jungles Talookdars held their places of strength; the whole country was broken up by separate centres of tyranny of the most grievous kind; lawful authority there was none; and, when the British columns forced their way into the recesses of that gloomy land, the light which their pioneers shed on its deep jungles was but a type of the moral light penetrating the deep darkness of licence and misrule: 1575 dismantled forts, 720 guns, and 1,000,000 of arms, surrendered, were a guarantee for future quiet.

I have thus endeavoured briefly to sketch the most prominent operations, sieges, and battles. Other wars there are deserving the notice of the historian, but which yet in the blaze of these greater triumphs are scarcely seen. There was, for instance, the war carried on against the hill-tribes of Sawunt Warree, the campaign of which deserves attentive study, as a specimen of the difficulties attendant on the reduction of hill-forts.

The narration of long series of successes, not unmingled with reverses, which I have had occasion to remark, has shown that England may depend on the deeds of her forces by land and by sea. I do not know whether the principles assumed will appear to receive confirmation from the instances of the battles quoted. The decision is left with full confidence to those, whose service in the field makes them the most competent authorities to criticise and to judge.

It may be asked, possibly, why I should undertake individually a duty which might almost be supposed to be a work of supererogation? It is briefly this: standing apart in some sense from the services, and therefore, perhaps, judging more accurately what the feeling of the country is in their regard, I have had occasion to notice with what true pride every exploit is noticed. I have also observed that there exists lack of knowledge, not only with respect to the perils and labours encountered, endured, and overcome, but in some cases also as to the motive and sustaining principle of the true soldier, which is so evident in the British army. It is that spirit of duty which was manifested so strikingly in the great Duke, which supplies the will and the capacity to achieve great successes. It was that spirit of duty that inspired Willoughby and his comrades at Delhi, when they plunged unhesitatingly amid the ruins of the Arsenal into that cloud of smoke whence human eye never saw that gallant man emerge. It was that spirit of duty which told Fulton, when besieged in Lucknow, never to despair. It was that spirit of duty which animated Tew of the 22nd, at Meanee, to enter the gap where he knew he must remain. It was that spirit of duty which told the soldiers of the "Birkenhead" what the countenance and bearing of the British soldier should be, no matter how hopeless his lot, which kept them calm on that sinking deck as on a parade ground. It was that spirit of duty which, in the

blazing "Europa," brought confidence to all those who looked upon the soldiers in that imperilled ship. It is that spirit of duty which has, I believe, been throughout, and will continue to be, the guide of the British soldier.

> "Not once, or twice, in our fair island's story,
> The path of duty was the way to glory;
> He that ever following her commands,
> On with toil of heart, and knees, and hands,
> Thro' the long gorge to the far light, has won
> His path upward and prevail'd,
> Shall find the toppling crags of Duty scaled,
> Are close upon the shining table lands
> To which our God himself is moon and sun."

In the tumult and conflict of opinion that is now raging over Europe, and in the kindred perturbations beyond the Atlantic, I can see no peace or security for the world, and for the advance of civilization, except in vindication of that reasonable, resolute, calm strength which represses aggression, and, happily, often prevents it from being meditated. In the military strength of England I see the best guarantee for the progress of civilization, the security of the world—I am almost tempted to add, in the military strength of England alone.

THE CHAIRMAN: Colonel Adair, I am afraid, from physical infirmity to-day particularly, and from want of experience in the post I occupy, that I am unable to do justice to the task which devolves upon me. At the same time I should be wanting in my duty to myself, to this meeting, and to this Institution, if I did not return thanks to you for your kindness in getting up these lectures, and for the admirable manner in which you have delivered them. [Applause.] The manner in which you have treated them would indicate deep research on your part, which could only have been induced by a thorough love of the subject; while in the delivery of them you have exhibited a fluency of language, and a perfect modesty of tone, which I must say does you the highest credit. It is only to be lamented that a gentleman with so thorough a military feeling as you possess should not be enrolled in our service. I feel thoroughly persuaded that such lectures as these must do good to all who hear them, in recalling to our minds circumstances which may have escaped us, and in inducing us to refer to our books for further information. I do not confine my observations to these particular lectures. To all the lectures that are given in this room I refer, feeling thoroughly persuaded that they must do an infinity of good. I could only wish there had been more persons present to hear this last lecture; but I suppose the weather, Ascot, and other circumstances, must be the cause of so few being present. In the name of the meeting, and of the Institution generally, I beg to return you our thanks, Colonel Adair.

Friday, June 21st, 1861.

MAJOR-GENERAL THE HON. J. LINDSAY, M.P. in the Chair.

THE DEFENCE OF PORTSMOUTH BY MEANS OF ADVANCED SEA WORKS.

By W. A. BROOKS, Esq. C.E.

THIS subject necessarily involves a consideration of the state of Portsmouth, Langston, and Chichester Harbours, and I propose to treat it under the following heads:—

Firstly. As to the present state of those harbours, and the causes which have produced the several impediments to navigation which are experienced.

Secondly. As to the means which are available for the removal of those impediments.

Thirdly. As to the result which will be produced by the construction of works for the improvement of the bars of Portsmouth and Langston Harbours, when considered in reference to the sea-approaches to those harbours and adjacent roadsteads.

Fourthly. As to the power of augmenting the accommodation or berthage for vessels of large draught of water.

Fifthly. As to the effect which those works will have in improving the military defences of Portsmouth Harbour, the roadstead of Spithead, and adjacent coast.

A study of the earliest *published* charts of Portsmouth Harbour down to the elaborate and beautiful one by Captain Sherringham, R.N. now in use, shows that the available depth of water in the sea-reach or channel leading to the harbour has at no time exceeded 2½ fathoms, at low water of spring-tides. The survey by Captain Collins, the Hydrographer to Charles the Second, and those by Captains Mackenzie and Sherringham, all record an available depth of only 2¼ fathoms.

The position of this shoal, which by its presence reduces by one-half the general depth which would be otherwise available in the channel and on the sea-bar of Portsmouth Harbour, is very clearly defined in the three surveys referred to, and is shown to consist of a bank separating the deep pool of the harbour from the deep-water channel without. Thus, almost on the threshold of Portsmouth Harbour, there has existed, probably for several centuries, a barrier which is capable of being effectually removed by the scouring action of the tidal current when properly trained.

A year's work, and the expenditure of a sum, certainly under thirty thousand pounds, would raise Portsmouth from the position of a second to that of a first-class port.

With the present available depth into Portsmouth Harbour of only 13 feet 6 inches at low water of spring-tides, and a flow of from 14 to 15 feet only, the enormous annual charges upon the nation which are entailed by reason of this deficiency of depth of water for the passage of ships of war may be readily accounted for.

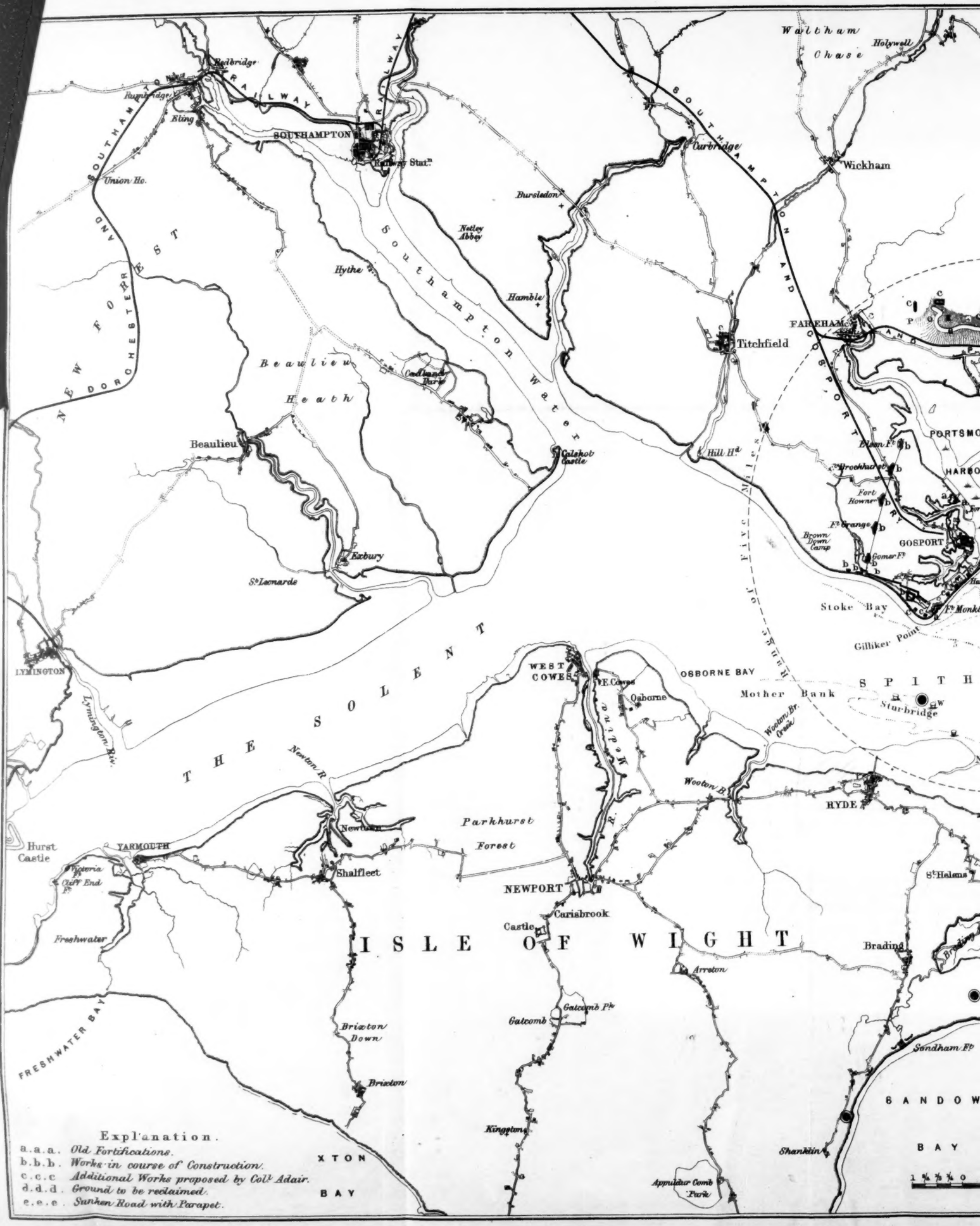
If nature had been the sole cause of creating this great impediment to the free ingress and egress of ships of large draught of water, the attempt to remove it might be stigmatized by inexperienced people as a work which might be found to be useless, as "warring against nature;" but long experience convinces me that the cause of the existence of this shoal, the opprobrium of Portsmouth, is really due to the hand of man—to the formation of ancient quays within Portsmouth Harbour, which have had the effect of forcing the ebbing current to deviate from its normal course, which throughout its seaward flow below the present entrance into Portsmouth Harbour must have occupied the same channel taken by the flood current even at the present time, or have ranged close to or parallel with the present shore between Portsmouth and Southsea Point.

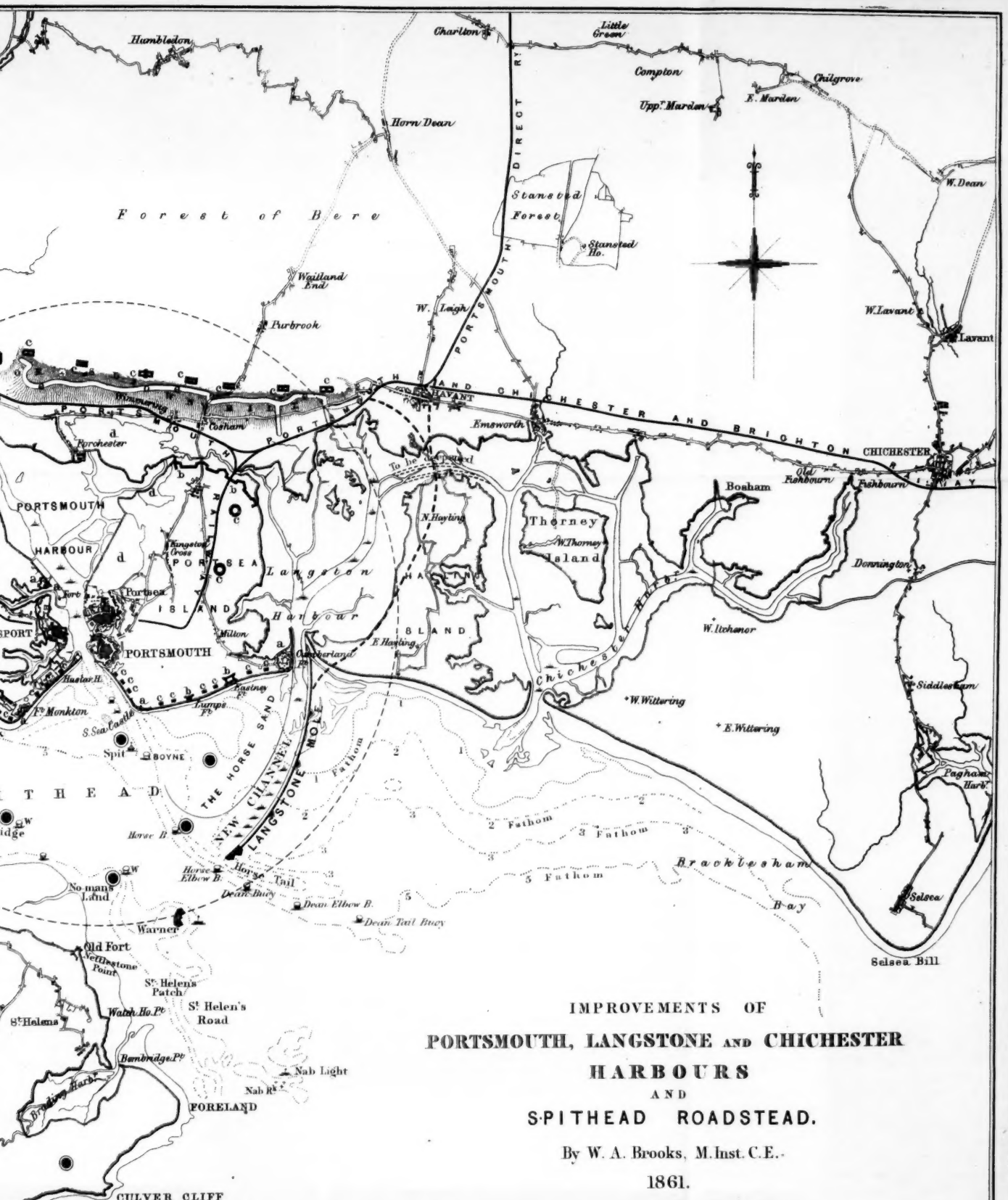
That the Admiralty is fully awake to the importance of removing this shoal is proved by the dredging operations undertaken for that purpose; but, inasmuch as this mode of treatment is simply removing effects without attacking and removing the cause of the existence of the shoal, it must prove unsatisfactory; firstly, on account of entailing an endless expense; and, secondly, because a large portion of the sand disturbed by dredging must be carried by the flood-tide into the harbour.

The paramount importance of increasing the present depth over this barrier fully justifies, however, the temporary remedial measures which have been hitherto attempted by dredging operations, even were they tenfold more expensive than is the case; and it only remains for me to point out the cause of the existence of this shoal, and the mode by which it may be removed effectually.

In the normal condition of Portsmouth Harbour approaches, or before the mouth of the haven was partly throttled by the construction of works on the spit of sand called "Blockhouse Point," and by those at "Portsmouth Point" on the opposite or left bank, there must have existed a broad and direct course into the harbour, with an available depth of not less than 5 fathoms at low water of spring-tides, because at that time the flood and ebb currents occupied the same channel. This condition ceased however with the erection of the works on the points of land above described, and the construction of the present quays and works on the Portsmouth shore of the harbour; which latter have the effect of deflecting the current of the ebb to the opposite or western side, and, but for the resistance it meets with there by the presence of the Spit sandbank, it would continue in the course thereby impressed upon it by the influence or direction of those quays, and would finally pass Southsea Point at a distance of about half a nautical mile to the westward of the latter.

Another result of this deflection to the westward of the current of the ebb-tide by the quays of Portsmouth is the production of a considerable eddy below Portsmouth Point, in which is deposited the sand which was previously held in suspension during the rapid course of the current out of the harbour, and thus is formed that long bank of sand which, tailing down


Waltham Chase
Holywell
Redbridge
Romsey Road
Eling
SOUTHAMPTON
Railway Stat.n
SOUTHAMPTON AND DORCHESTER RAILWAY
SOUTHAMPTON AND GOSPORT RAILWAY
Curbridge
Wickham
Union Ho.
Bursledon
Netley Abbey
Hythe
Hamble
Southampton Water
NEW FOREST
Titchfield
FAREHAM
Beaulieu Heath
Beaulieu
Calshot Castle
Hill H.d
PORTSMO
HARBO
Fort Rowner
Fort Grange
Brown Down Camp
GOSPORT
Gomer Fort
Fort Monkl
Stoke Bay
Gilliker Point
Eastern Entrance to Portsmouth Harbour
Exbury
St Leonards
LYMINGTON
Lymington Riv.
THE SOLENT
WEST COWES
E. Cowes
OSBORNE BAY
Osborne
Mother Bank
SPITH
Sturbridge
Wootton Br. Creek
Newton R.
Wootton R.
RYDE
Parkhurst Forest
Hurst Castle
YARMOUTH
Victoria Pier
Cliff End Fort
Shalfleet
NEWPORT
Carisbrook Castle
St Helens
Freshwater
ISLE OF WIGHT
Brading
Arreton
Gatcomb
Gatcomb Pk
Brixton Down
Brixton
FRESHWATER BAY
Sandham Fp
BANDOW
BAY
Kingston
Shanklin
Appuldur Comb Park
XTON
BAY
Explanation.
a.a.a. Old Fortifications.
b.b.b. Works in course of Construction.
c.c.c Additional Works proposed by Col.d Adair.
d.d.d. Ground to be reclaimed.
e.e.e. Sunken Road with Parapet.



IMPROVEMENTS OF
PORTSMOUTH, LANGSTONE AND CHICHESTER HARBOURS
AND
SPITHEAD ROADSTEAD.

By W. A. Brooks, M. Inst. C.E.

1861.

Note.— *Langstone Mole and its New Channel form the Advanced Sea Works or Defences to Portsmouth and Spithead, projected by W.A. Brooks in connection with a Fort on the Warner Shoal proposed by Admiral Sir Thos Maitland, C.B.*
The Forts on the Sturbridge, Spit and Horse Sands and on No-mans-land were projected by the Royal Commission on National Defences.

SCALE.

¾ ½ ¼ 0 1 2 3 4 5 10 15 Miles

J.R. Jobbins, 3 Warwick Cr. Holborn

with the ebb, flanks the Portsmouth shore, and closes up the north end of the deep channel made by the flood-tide on ranging along the shore between Southsea Castle Point and Portsmouth.

This bank has on it a depth of about one-third of a fathom at low water of spring-tides where its shoulder joins the beach at Portsmouth Point, and, as before observed, "tailing down with the ebb," it forms a junction with the Spit sandbank on the western side of the channel; the greatest available depth over it, or in the sailing track to Portsmouth Harbour, being only $2\frac{1}{4}$ fathoms (13ft. 6in.) in depth at low water of spring-tides. This miserable depth is all that is to be found in the only approach to the Royal Harbour or Naval Station of Portsmouth, in lieu of the available depth being only limited by that on the sea-bar, which varies between $4\frac{1}{4}$ and $4\frac{1}{2}$ fathoms at the same time of tide.

The chart shows that deep water is maintained in the channel taken by the ebb, until the current of the latter is arrested by the resistance it meets with at the Spit Sand; which resistance causes the greater portion of the current to be deflected towards the opposite or Southsea shore, to which latter it is also drawn by the slope of the bed towards the deep channel or swatchway made along that shore by the current of the flood-tide while moving in an unobstructed course. To reach this deep-water channel of the flood, the current of the ebb abruptly changes from the course which had been previously impressed upon it on leaving Portsmouth Harbour, and is compelled to pass over the tail of the bank, which has been previously described "as flanking the Portsmouth shore below the Point, and joining the Spit Sand;" passing in fact over a ridge or bar of sand, shingle, or gravel, which may be fairly described as a submarine weir of great width between the opposite foreshores, and upon which, consequent upon the great width of the weir, there must necessarily exist very little depth of water, the space occupied by the current of the ebb, in its passage across the shoal or weir, having lost in depth of channel what it had gained in breadth by the oblique course of the current while crossing the channel.

The width of the channel, in this as in all other cases, is to be estimated by the space occupied by the current in its passage across the sand-bank or natural weir, and in this example the course of the current is so abrupt from shore to shore as to readily account for the change from 6 fathoms at low water in the pools above and below the bank or shoal to only $2\frac{1}{4}$ fathoms upon the latter.

With an impress upon the current of the ebb still more to the west of south on leaving the harbour, the reaction would be more abrupt, and the available depth on the bar or weir would be still further diminished, as is invariably found in all rivers or channels where the stream crosses to the opposite shore.

At Portsmouth Harbour, as elsewhere, the current of the ebb is the governing power, because the ebbing current has not only the additional influence of the water from the drainage of the country, but of that element in its favour over the current of the flood-tide arising from the slope of the shore towards the depths of the sea.

Without the counteraction of those influences, the tendency of the action of the flood-tide is to fill up rapidly all natural tidal receptacles; and hence the vast marine deposits of sand in harbours and estuaries, and their gradual

diminution by the accretion of land; a process which is invariable, except where the seashore consists of precipitous hard cliffs rising out of so great of depth of water as to be little, if at all, acted upon by the sea when disturbed by tempestuous weather.

Hitherto the deposit on the eastern side of the channel below Portsmouth Point has alone been noticed by me, but it will be evident that there is also a considerable eddy created by the ebb-tide on the opposite bank or foreshore on its rushing out of the harbour past Blockhouse Point, forming the site of the Spit Sand, which latter, however, owes to other causes a great portion of the effects which are visible in the form of the vast marine deposit called "the Spit Sand," of which I shall take notice in another division of this paper.

Having thus described the principal effects produced by the ebbing waters of Portsmouth Harbour upon the navigable condition of the channel below, or seaward, there remains only for me to notice those of the flood, as immediately affecting the condition of the channel within Portsmouth bar, where that flood-current comes within the overpowering or dominating influence of the ebbing tide.

Thus the current of the flood-tide (which had previously ranged along the deep channel, past Southsea Castle), on encountering the resistance offered to its course by the bank or weir across the channel, made by the eddy on the ebb below Portsmouth Point, is, in its turn, compelled to change its course, and to pass over the shoal into the harbour; its further course to the northward, along the Portsmouth shore, being stopped by the shoulder of the shoal until the tide attains greater head, when its scouring action prevents the total conversion of that part of the shoal into *terra firma*.

On this I speak with the confidence given by long experience in the removal of many shoals having precisely the same cause of origin as this at Portsmouth, which has been so long left to mar the usefulness of our principal naval station.

The discussion on this subject will probably produce some report from one of the many able civil engineers who at one time or another have been employed by the Admiralty to report upon Portsmouth Harbour, to show that it has not escaped their notice; but if it prove that the conservators of the harbour have not had the cause of the formation of this opprobrium of Portsmouth Harbour properly brought under their attention, I trust that an effort will be made to rescue Portsmouth Harbour from the defect which has hitherto diminished its usefulness as a station in time of war, and has been the cause of a constant large waste of public money.

With the approach to Portsmouth Harbour in its present state, no heavy line-of-battle ship can enter or leave the harbour, except on the top of spring-tides, whereas a comparatively small outlay of money would enable ships of the largest draught of water to sail out and confront an enemy almost at any state of the tide, in lieu of being barred up within the harbour, as they now are, for many days together.

With Portsmouth Harbour sealed up as it now is during the whole of neap tides, the reserve fleet must necessarily be constantly moored in the roadstead of Spithead, or be insulted by an enemy who has the wit to make his attack at that epoch of the tides.

It was thus that in former wars much of the repairs to ships and refittings were necessarily executed at great extra cost and inconvenience at Spithead, instead of resorting to the quays and docks of Portsmouth.

The remedy for this evil is to be found either by restoring Portsmouth Harbour to its normal condition, or by the construction of a groyne or work below the mouth of the harbour from its right bank, which will have the effect of turning the current of the ebbing water out of its present direction towards the Spit Sand, and of compelling it to take a direct and easy course towards the channel occupied by the flood-current between Portsmouth and Southsea Point.

Having, in the above remarks, fully discussed the condition of Portsmouth Harbour, as affected by the presence of the shoal between Southsea Point and the entrance to Portsmouth Harbour, which is commonly, but very erroneously, known as the Bar of Portsmouth, it is now my duty to direct attention to the real sea-bars of Portsmouth, Langston, and Chichester Harbours, and to account for the vast difference as regards depth of water which exists between Portsmouth sea-bar and those of Langston and Chichester Harbours.

The bar of Portsmouth commences at a distance of half a sea mile below Southsea Castle Point, and has a depth on it of from $4\frac{1}{4}$ to $4\frac{1}{2}$ fathoms at low water of spring tides, which depth continues to a mile below the Point, where, on meeting with the strong current through the roadstead of Spithead, the depth rapidly increases to 9 fathoms, and in mid-channel to 17 fathoms at low water.

The bar of Portsmouth possesses this great depth of $4\frac{1}{4}$ fathoms at low water on account of its site being under the range of the strong current, or sea-tide, which sets directly across the point of discharge of the ebbing water of the harbour; and any alteration of the configuration of the coast and sands on each side of the sea-reach which would have the effect of bringing the site of the bar more southerly, would expose it to the action of a still stronger tidal current, and the depth on the bar would be consequently increased.

The site of Portsmouth sea-bar is clearly defined on the outline chart, from the excellent survey of Captain Sherringham, R.N., of that useful branch of the service the Hydrographical Department of the Admiralty.

The current out of Portsmouth Harbour, after passing Southsea Castle Point, yet retains sufficient velocity to insure the continuance of a deep-water channel, by reason of the latter being contracted by the western shore of the Horse Sand, which forms the left bank of the sea-reach, and the eastern side of the Spit Sand, which forms its right bank, until that current falls into the strong current or tideway of Spithead Roads, or debouches into the contracted channel between the Horse Sand and the north shore of the Isle of Wight.

Very different from the above is the physical condition of the current of the ebb on leaving the equally vast tidal receptacles of Langston and Chichester Harbours. Thus the current during the first hour of the ebb from Langston Harbour takes a direct course to the westward, over the Horse Sand, at the rate of only one knot per hour.

On the second hour it changes its course to the south-west, but runs at the same slow rate; and it is to be observed that while the current of the

ebb takes this course to the west and south-west, it has to force its way through the eddied water created by the outset from Portsmouth Harbour past Southsea Point; and it is this resistance, commencing at almost the very outset of the current from Langston Harbour, which reduces the velocity of the latter to one knot per hour, diminishing still further on its progress to the westward.

At the third hour of the ebb from Langston Harbour the set of the current changes to the south, and during the fourth and fifth hours it takes the same direction but with a greatly increased velocity, having at this time a true and unobstructed passage to sea, the discharge from Portsmouth Harbour being also towards the same quarter, or rounding the eastern shore of the Isle of Wight.

The bar of Langston Harbour has from the above circumstance a depth of only 2 feet on it at low water of spring tides.

Of Chichester Harbour and its bar it is enough on the present occasion to remark that, subject to the same geographical defect of position in respect to the waters discharged from it being out of the reach of a true and rapid coast tide, it, like the neighbouring Harbour of Langston, has also the same defect of a bar with only two feet on it at low water of spring tides, although as a pure tidal receptacle its capacity greatly exceeds that of Portsmouth Harbour, which has nevertheless, from the causes before described, a depth on its bar of 25 feet 6 inches at low water of spring tides.

These examples of the condition of Langston and Chichester Harbours, notwithstanding their immense capacities as tidal receptacles, are useful as demonstrating that it is not merely to the extent of quantity of tidal water that the valuable qualities of even tidal harbours are due, but to the well regulated nature of their discharge, or to the favourable conditions under which their waters debouch into the ocean.

To fully understand why the geographical positions of the points of discharge of the waters of the great tidal receptacles of Langston and Chichester Harbours are so unfavourable to the existence of deep water at the mouths of those harbours, while the reverse is experienced at Portsmouth, it is necessary to take a general or enlarged view of the coast, and mark the course taken by the great tidal current which supplies those harbours. It will then be seen that the current of the flood, after rounding the northernmost point of the Isle of Wight, is deflected by the Hampshire shore towards the south-east; thus throwing the whole of the foreshore eastward of Gillicker Point into a comparatively eddied state; and hence the main cause of the vast marine deposits forming the Spit Sand, and the Horse Sand, through which the waters of Portsmouth and Langston Harbours have to force their way to sea.

This enlarged view of the coast is necessary to be taken previous to a consideration of the treatment proper for the amelioration of the condition of Portsmouth, Langston, and Chichester Harbours, as well as Spithead roadstead.

It is necessary also to have recourse to the valuable information on the tidal currents of this coast procured by Captain Sherringham, R.N., to be able to form just conclusions of the effects which will result from any alteration of the general outline or configuration of the coast, or contour lines of soundings, by the formation of works for the amelioration of the

physical conditions of the harbours which form the subject of this paper; and here I cannot but express my thanks to the Hydrographical Department of the Admiralty, for having afforded me such sure guides as those careful observations on the tides have been found to enable me to give a firm opinion on this important subject; and to prove that no danger can possibly accrue to Portsmouth Harbour, or to the roadstead of Spithead, by reason of the treatment proposed in this paper as that proper to be adopted for the necessary improvements of the Harbours of Portsmouth, Langston, and Chichester.

The printed observations on the set of the currents given by Captain Sherringham on his chart of Portsmouth, Langston, and Chichester Harbours, demonstrate that they are supplied by two tidal currents, the earliest arriving by the channel between the Isle of Wight and the main land, with a course to the eastward for four hours, flowing during that period with a velocity of from one and a quarter to one and a half knots per hour, through the roadstead of Spithead.

At the end of this period the influence of the tide coming up channel, or along the back of the Isle of Wight, begins to be felt, and slack water ensues until nearly towards the end of the fifth hour, when the current begins to turn or run in from the south-east, but at a rate of only one-fourth of a knot per hour; and this continues during the sixth and seventh hours from the commencement of flood-tide, moving, however, at the rate of only three-quarters of a knot per hour during spring tides.

On the return of the tide the current sets to the westward between the Isle of Wight and the mainland, running for the first two hours at the rate of one and three-quarter knots per hour during spring tides. During the third hour the current takes a south-easterly direction, at the rate of half a knot per hour; and for the remaining period of the ebb at one knot.

From the above the following practical conclusion is arrived at, viz.: that the governing power of the oceanic tide in the roadstead of Spithead, is that which takes place while the tide flows from the westward, or round the north side of the Isle of Wight; and that during the latter division of the tide, or of the supply which comes round the back of the Isle of Wight, the current runs at too slow a rate to be able to have any material influence in determining the condition or features of the outlying sands, or in forming the deep-water channels. A little more to the eastward, or in the channel to Portsmouth between the Warner Shoal and the Horse Elbow Buoy of the Horse Sand, the same dominating power of the flood current coming north of the Isle of Wight is experienced.

There, during the first four hours, the current sets to the east at the rate of one knot and a half per hour, then slackens as the southern tide comes into confliction with it, until that southern current, at the end of the sixth hour, attains a velocity of three-fourths of a knot; and finally, of one knot per hour during the seventh hour of the flow.

In this respect the power of the earlier division of the tidal current is paramount to that of the later division, just as it is found in rivers that the ebbing current is the governing power; all sand banks forming their junction with the shore where during the ebb tide eddies are found to exist, and all those sands invariably tail down with the ebb. So likewise is it

found in respect to the features presented by the sands lying in the channel between the Isle of Wight and the coast of Hampshire, as far eastward as Chichester Harbour; they tail down with the course of the more powerful flood current, as it is strongly marked out by the features of "the Mother Bank" and "the Horse Sand."

Abreast of Chichester Harbour, and to the eastward for some distance, the tide flows bodily on the shore from the southward, and the worst condition exists there as respects the possibility of obtaining deep water on that line of coast at any harbour situated in that locality, without encountering a very large outlay, by the construction of extensive works to reach the true lateral or coast tide.

The preceding observations warrant the following deductions:—

First. That the great difficulty at present experienced at the Royal Harbour of Portsmouth of want of depth of water in the channel can readily be removed by the simple construction of a work on the Spit Sand to lead the ebbing waters into the channel now occupied by the current of the flood.

By this operation the depth on the shoal in the sea reach, which is now only two fathoms and a quarter at low water, will be increased to from five to six fathoms; that being the general depth in the same channel where the current has a true set down it.

Secondly. That in order to increase the depth on the sea-bar of Portsmouth Harbour, from its present depth of four and a quarter to six fathoms, the embouchure of the channel must be made subject to local influences, which will bring it under the domination of a still more rapid current than is found on the present site.

The improvement of the bar of Portsmouth Harbour is, however, altogether contingent upon the construction of works for the removal of the bar of Langston Harbour, which latter has on it a depth of only two feet at low water, from the causes previously assigned in this memoir

To remove Langston Bar a pier or mole must be constructed from the eastern side of the Harbour at "Gunner Point," following the course shown by the strong red lines on the chart to within about five hundred yards of the Horse Elbow Buoy. Along the concave or the western side of this pier, the vast volume of the waters of Langston Harbour will range until they are discharged into the strong tideway which exists between the tail of the Horse Sand and the Warner Shoal, where both flood and ebb currents run at the rate of from one and a half to two knots per hour; and where the velocity will be found to be too great to allow of any deposit or formation of a bar there from the material previously held in suspension by the current from the harbour.

It will be seen by the chart that I do not propose to carry the mole-head clear of the whole of the Horse Sand, because I am confident that the portion left to the southward of the mole, and on which there is now a depth of from one and a half to two fathoms of water at low water, will become of a not less depth than five fathoms on it, owing to the increased rate of current consequent upon the contraction of the present channel by the formation of the mole.

An extension of this pier or mole to the southward of the Horse Elbow Buoy might have the effect of too much accelerating the current in mid-channel.

The certain result of the formation of this pier or mole at Langston Harbour will be also the establishment of a channel along its concave face, having a depth of not less than six fathoms at low water of spring tides, forming in fact a spacious sea-reach of the harbour of three miles in length, in which first-rates may be moored with all their artillery and sea-going stores on board, and from which they may be sent to sea at any time of the tide.

The next subject for serious reflection is as to the effect of this mole upon the currents of the flood-tides into Portsmouth Harbour.

On this I can speak with decision as favourable to the work, because it must follow, as a natural result of the construction of the pier, that the flood-tide coming from the westward will derive the advantage of an accumulation or heaping up of its waters from the funnel-shaped entrance which will be presented to them by the feature of the mole.

It has already been proved that the weight of the tide, or dominating current of the flood, passes between the Isle of Wight and the Hampshire coast. For four hours, therefore, of the strongest run of the flood-tide, the effect of the presence of the proposed mole of Langston Harbour will be to help to raise the level of the current, or heap up the tidal water and force it to run with greater strength up the channels of Portsmouth and Langston Harbours, while at the same time it will present no obstruction to the weaker and later tide which flows from round the back of the Isle of Wight, because that current sets bodily upon the shore, as is beautifully shown on Captain Sherringham's chart.

Anticipatory of any objection being raised to the contraction of the eastern channel by the formation of the mole, it may not be out of place to notice that the channel existing between Hurst Castle and the Isle of Wight is only one-fourth of the width of channel proposed to be left by me between the Langston Mole-head and Nettlestone Point, on the north shore of the Isle of Wight. Between Hurst Castle and the Isle of Wight the current runs at the rate of five and a half knots per hour, whereas in the channel past Langston Mole the current will not much exceed two knots per hour. To arrive at this result, the observations of Captain Sherringham have again been of great service to me. Thus, I gather from them that on the first four hours' flood from the west the stream runs in mid-channel, abreast of the Warner Lighthouse, at the rate of one knot and a half per hour; on the fifth hour of the flood there is the same confliction of the channel-currents as previously described in the Spithead tidal observations; and on the sixth and seventh hours the set of the current is from south-east to north-west, at from three-fourths to one knot per hour. At the edge of the Horse Sand and over it the current moves much more languidly, and hence the cause of the deposit which forms that bank.

An injurious effect upon the tidal supply of Portsmouth and Langston Harbours by reason of the formation of the mole could only occur if the dominating current ran from east to west along shore in lieu of the existing opposite direction.

The immediate effect upon the fore-shore and outlying banks of the coast by reason of the formation of the mole comes next under consideration.

First, as regards the fore-shore and Horse Sand lying between Southsea Castle and Langston Harbour, no doubt can exist as to the accretion of

sand thereon, and of the probable conversion into land of a large portion of the Horse Bank, and attendant upon this will be two great useful results, the first being the concentration of the power of the ebbing current out of Portsmouth Harbour until it falls into the rapid sea-tideway, entailing thereby the complete removal of the sea-bar of Portsmouth, or changing the depth on it from four and a quarter to at least six fathoms at low water of spring-tides.

The second useful result will be that of insuring the scouring action of the ebbing waters from Langston Harbour upon the bed of the new channel, on the concave side of the proposed mole. In this channel of three miles in length there will be maintained at least six fathoms in depth at low water of spring-tides; thus immensely increasing the available anchorage for vessels of the largest class to lie afloat ready for sea at the shortest notice.

The deep-water channels of Langston Harbour will, in like manner, become available for line-of-battle ships. The floating area of the sea-reach of Portsmouth Harbour will be also available for mooring therein ships of the line; and it may, in truth, be said that the formation of the pier or mole at Langston will add to the Portsmouth naval station, in the sheltered sea-reaches of Portsmouth and Langston Harbours, fully six miles in length of harbour-room, or floating berths for vessels of thirty feet draught of water more than exists at present, without calculating the berthage in Langston Harbour before alluded to.

Nor does the enormous advantage gained by constructing the mole or pier of Langston Harbour stop here; because, by it, great shelter will be procured from those gales which render the roadstead of Spithead at times inconvenient.

The channel to the westward and Spithead roadstead would, in fact, be converted into a harbour second to none in the world.

If, therefore, the proposed mole at the mouth of Langston Harbour be made, it will become a certainty that a true run of the ebb tide will be established along its western or concave side, of sufficient rapidity to prevent the possibility of deposit, even during the weakest tides, and of power capable of maintaining at least six fathoms depth at low water; the point of discharge being also secured where that rapid tideway exists which has been found to insure deep water. The channel would have an average width of at least five hundred yards; and as ships moored in it would be sheltered by the mole, its rugged seaward long slope of rock would act as the glacis of a fortress, and over it ship's batteries would be able to pour a destructive fire with almost impunity to themselves—safe as if "locked up in steel."

From a perusal of the evidence before the Royal Commission appointed to report upon the Defences of the United Kingdom, as well as by the expressions of the members of that honourable commission, it is clear that a strong feeling exists as to the necessity of barring-up the approach to the Island of Portsea over the Horse Sand; more than one gallant and intelligent officer declared that the defence of Portsmouth would be imperfect without it, notwithstanding the passage by the main channel up to Portsmouth might be rendered impracticable to an enemy by the establishment of powerful isolated forts on the Horse, No Man's Land, and Sturbridge

Sands. Admiral Sir Thomas Maitland urged also the propriety of an additional fort, more in advance, viz. upon the Warner Shoal; and, as that position is exactly opposite the Mole Head, I have adopted the suggestion of the gallant admiral, as it would materially aid to repel the passage of a hostile force by the close fire which it would give.

From this fort on the Warner Shoal to Langston Mole-head the distance would be, by my design, less than 2,000 yards. But as, in addition to the heavy fire from ships moored behind Langston Mole, and of the batteries constructed upon it, an approaching hostile force would also have to encounter the concentrated fire from ships moored within what would then be a harbour, small chance would there be of even the iron sides of the enemy not being knocked in by the fire of the artillery of the present day.

These works are not brought forward as improvements upon the able design given by the Royal Commission, but are contingent or necessary to carry out in its integrity what appears to have been the strong desire of the scientific men of which it was composed, viz. to force the enemy's ships to take up positions from which they would not be able to shell the naval arsenal of Portsmouth, even with the improved artillery of the present day. Thus it appears to have been the desire of the Royal Commission to construct a barrier on the Horse Sand, between the fort proposed on its southern margin, and Cumberland Fort on the Southsea Beach, and evidence was obtained as to the cost of depositing materials to form that barrier.

Two systems of construction were proposed;—one was for a solid barrier for the entire length, and the other for detached masses of masonry of fifteen feet in length, with intervals of ten feet, to allow the continuous passage of the tidal currents.

The latter scheme must have failed, because sufficient obstruction to the already languid current over the Horse Sand would have been created by those detached blocks of masonry to have insured the creation of a continuous barrier of sand, and, in fact, the ultimate conversion of the area of that portion of the Horse Sand into dry land, which lies to the westward of the proposed barrier. It would have been simply the formation of a new foreshore, upon which a hostile force could land with greater facility than on the present shore, between Southsea Castle and Cumberland Fort, because the latter line can have its defence strengthened by the batteries of ships moored in the sea-reach of Portsmouth.

Very different, however, would be the state of the coast, as regards its defence, if the mole were made as proposed by me, from the shore at Gunnen Point, on the eastern side of the entrance to Langston Harbour; because, even supposing a landing from boats could be effected upon the rugged foreshore or long slope of the rubble breakwater, there would yet remain the great difficulty of dragging the boats over it in order to effect a passage across the wide and deep channel on the western side of the mole, during which they would be exposed to the flanking fires from the batteries on the mole, and the direct fire from the forts on the present Southsea shore. Our blockships and gunboats would also add to the defence.

All the arrangements for the defence of this line of advanced sea-works

and shore-batteries to the eastward, would, of course, be maturely considered and arranged by our military authorities. I have merely sketched out works destined to give a flanking fire upon any force which might attempt a lodgment on its seaward face; but this latter might be made impracticable by only carrying up the rockwork, or glacis, to within a foot of high water of spring-tides as a general measure, but with portions raised a few feet higher where our wooden walls or floating batteries required additional protection.

The elevation of the mole, and the state of the tide, would determine the nature of the floating batteries which would be moored in the channel for its defence, and to assist in repelling an attempt to force a passage through the main channel to Spithead Roads. Thus, at high water, or about that period, gunboats would pour over the crest of the glacis or rugged seaward slope of the mole a most destructive fire, without the position of their own hulls being observed, except by the flash of their guns; and, as the tide fell, the deck batteries of larger vessels would in the same way be brought into action.

Assuming the possibility of an enemy's mortar-vessels to be able to approach and open fire within the range of a sea mile from the line of defence presented by Langston Mole, they would even then be at the great distance of above ten thousand yards, or about five miles and three-quarters from the dockyards of Portsmouth, and about eight thousand yards from the southernmost lines of the works defending Portsmouth.

Portsmouth and its suburbs may therefore be considered to be secured from any danger by bombardment from the sea by the realisation of the advanced seawork of Langston Mole; and if a cut were made to connect the deep-water channels of Langston and Chichester Harbours, having twenty-four feet in it at high water of spring-tides, our gunboats and blockships could then, at pleasure, be transferred to Chichester Harbour, to assist in the defence of the coast to the eastward. The cut I propose is shown on the chart near Hayling Bridge, and is of easy execution, an available depth of nine feet at low water of spring-tides existing at only a distance of a mile and a half from the shoal navigation which connects the two harbours at Hayling Bridge.

I propose, in the present instance, to confine the improvement of Chichester Harbour to the execution of the dredging at Hayling Bridge to form a deep-water connection with Langston Harbour, which would thus become the advanced port to Chichester Harbour.

In spring-tides, at tide time, vessels of large draught, of even 24 feet, would be able to make use of Chichester Harbour; and at neap-tides of a draught of from 18 to 19 feet, whereas at present the available depth is only about 16 feet in spring-tides, and 10 feet in neaps over the bar, and that only in calm weather.

The execution of the proposed lines of defence on Portsdown Hill would give a large supply of chalk to form the core of the mole at the mouth of Langston Harbour, as well as for the detached forts on the Warner Shoal; the material being brought by the railway from the mouth of the harbour to Havant, for which an Act of Parliament has been already obtained, or by a new line along the eastern margin of Langston Harbour.

The mole would thus become a simple work, presenting no difficulties of

execution, and would only require its eastern slope to be protected by a coating of rubble stone, brought from Swanage or Portland. Attendant upon the seaward extension of the mole would be a rapid deposit of sand on its seaward or exposed side; so that very little protection by stone-facing would be required, except between the level of half-tide and high water, so rapidly would the accumulation of sand and shingle take place in the angle between the mole and the shore to the eastward. A new foreshore would there be formed.

If the advanced sea-work of Langston Mole receive the honour of the approbation of the naval and military authorities, it will probably occasion some modification of the arrangement made by the Royal Commission on National Defences as to the works recommended on the Horse and Spit Sands; as I consider that those proposed detached or isolated sea-forts will be superseded by the floating batteries, which will be available with a greater range or sphere of useful effect.

Of the great utility of the work proposed by the Royal Commission on No Man's Land Shoal few will question; and probably few men of experience will deny the great advantage of having an additional strong position on the Sturbridge Shoal, or of floating batteries there.

In conclusion, I have but to state, on the subject of the formation of Langston Mole, that it may be easily completed within three years, and that even in two years a perfect barrier to the passage of even gunboats, at high water, could be readily made; and that during the same period a breakwater could be constructed for the foundation of the Warner Fort, which would enable our floating batteries, aided by the existing blockships, to render Portsmouth and the roadstead of Spithead secure from insult.

Evening Meetings.

Monday, July 8, 1861.

Captain E. G. FISHBOURNE, R.N. C.B. in the Chair.

Names of Members who joined the Institution between the 24th June and 8th July, 1861.

Annual.

Chetwynd, Hon. C. C., Capt. Unatt. 1*l.*
Collins, W. L., Capt. Victoria Rifle Vols.
Festing, E. R., Lieut. Royal Engineers, 1*l.*
Fuller, F. G. A., Lieut. Royal Horse Gds.
Home, Hon. W. S. D., Lieut. Gren. Gds. 1*l.*
Latour, W. Y., Lieut. Gren. Gds. 1*l.*
Lew, A., Paymaster R.N.
Paget, G. E., Cornet Royal Horse Gds. 1*l.*
Scott, C. H., Capt. 71st Highland Lt. Inf.
Slacke, W. R., Lieut. Royal Engineers.

DISCUSSION ON MR. BROOKS'S LECTURE ON THE DEFENCE OF PORTSMOUTH.

The CHAIRMAN.—Perhaps you will be kind enough to state the information upon which you ground your idea with respect to the tides. Gentlemen would like to have a little information upon that point to help them in the discussion.

Mr. BROOKS.—The information with respect to the set of the tides has been drawn from the able chart of Captain Sherringham, R.N. The data given there satisfactorily convince us that the body of the tide, which has the most powerful effect in determining the course of the channel, and in creating the eddies or sites of the banks lying off Portsmouth, comes from the westward. The first four hours' tide runs stronger than the last three. The first four hours' tide from the westward comes from the Needles, and, after passing the point at Cowes and at Osborne, is thrown against the Gosport shore; and then again deflected to the southern shore, or the north-east points of the Isle of Wight. The course of the current throws the part eastward of Gilliker point into an eddy, and consequently creates the Great Spit Sand. The same influence of tide extending to the south-east, there is a large space abreast of Southsea also thrown into an eddy; and that originates the great shoal called the Horse Sand. The formation of these sands, by the way in which they tail, shows that the westward tide is the strongest. On the fifth hour the tide begins to come from the south-east round St. Katherine's Point at the back of the Isle of Wight. For that hour the current is nearly stagnant; still that is the course of it. The sixth hour the current runs three-quarters of a knot per hour, and the seventh, it is a little more than one knot per hour. Along the coast east of Portsmouth the tide is sluggish, and opposite Chichester Harbour the supply tide comes directly from the south.

It may be argued by some, that putting this great Mole from Langston Harbour into the sea may offer some impediment to the flood-tide entering Portsmouth Harbour. That I say is impossible; because the great body of the tide is directly from the westward; therefore, if the Mole has any influence at all, it must be that of heaping up the waters, and creating a greater flow and a greater rise of tide in Portsmouth Harbour. I do not say that it would have much effect in this respect, but that is the effect it must produce. Against the body of the tide which comes from the south-east it is impossible that any obstruction can be raised. If the supply tide came from the eastward, then it would be a fatal objection to the formation of the Mole; and it might be said at once, "Here is an obstruction to the flow of the tide into Portsmouth harbour."

The CHAIRMAN.—While you are upon that point, can you state what is the difference between the time of high water in the harbour at Portsmouth and at Spithead?

Mr. BROOKS.—There is very little difference, I believe.

The CHAIRMAN.—I am under the impression that there is a considerable difference.

Mr. BROOKS.—Not much. Now, the tide that flows up Langston Harbour goes clean through the harbour; and on the return of the tide, you have the advantage of a good deal of the water which previously enters Chichester Harbour. My proposal is to make a communication between the pool of nine feet low water in Langston Harbour, and the same depth in Chichester Harbour, so as to be able to transfer block-ships or gun-boats from one harbour into the other. The certain result of making Langston Mole of a concave form would be to scour out a deep channel of not less than six fathoms at low water; and with this debouching into a strong tide-way, no bar could possibly exist. I feel sure there will be no bar, and this deep-water channel would enable our gun-boats and line-of-battle ships to deliver over the crest of the Mole an effective fire upon an advancing squadron. The Mole could be carried to the level of high-water at spring tides, or it could be carried to a higher level if necessary, so as to mask ships at high water.

One great feature of utility in this plan of mine is, that it would have the effect of keeping hostile vessels of war at such a distance that they would not be able to shell Portsmouth Dockyard. It carries out what I believe to be the intention or the wishes of the Royal Commission on National Defences. There was a desire manifested, and they got estimates for it, to make a breakwater from the proposed fort on the Horse Sand to Cumberland Fort on the west side of Langston Harbour. That must have had the effect of silting up and ruining Langston Harbour itself and the approach to it. That was the principal objection to it. Now, it is not attempted to be argued by me that making use of these forts and constructing these works will supersede the necessity for vessels of war to defend the channel south of the Mole-head. Nobody attempts to say that. Both are necessary, forts and ships of war; but the works I propose would enable our squadrons to lie in safety, and would relieve the country from any alarm as to our great naval station being in danger of destruction from an enemy.

Commander ROBERT SCOTT, R.N.—Before Mr. Brooks sits down, I should like to ask him one question with respect to the high water in Portsmouth Harbour. From which direction does the harbour receive its water? That seems to me to be an important point in connection with his proposed breakwater.

Mr. BROOKS.—For the first four hours the tide comes from the westward through the Solent; the fifth hour receives the addition of the coast tide from the south side of the Isle of Wight; and at the sixth and seventh hours the tide is from the same source, entering Spithead from the south-east. That is shown by Captain Sherringham's chart.

Commander SCOTT.—Does it not become high water in Portsmouth Harbour with the first of the ebb, sweeping down past Selsea Bill, then coming in against the Isle of Wight and filling Portsmouth Harbour? I have cruised a great deal about there, and it seems to me to be so.

Mr. BROOKS.—As an engineer, I should say an ebb tide cannot produce high water. The tide that really fills Portsmouth Harbour comes from the Channel round the back of the Isle of Wight. It does not come from Selsea Bill; it could have no effect. If the tide is falling at Selsea Bill it must be falling in every other place.

Commander SCOTT.—Owing to the entrance being so narrow at Hurst Castle, the flood tide does sweep up in the way you have defined, but enough water does not come through to fill up Portsmouth Harbour and make it high water there. The consequence is that the first ebb coming down sweeps past Selsea Bill. It is confined in a narrow space; it flows in between the Isle of Wight and the Hampshire coast during the ebb tide, and the water in Portsmouth Harbour rises considerably.

Mr. BROOKS.—I believe that the tide comes round from the back of the Isle of Wight. The ebb tide, that you are speaking of, does not run by the Solent at all, it has a much more easy course round the back of the Isle of Wight.

Commander SCOTT.—The Isle of Wight is an obstruction. It is just in the place to shelter Southampton Water, Portsmouth Harbour, Langston Harbour, and Chichester Harbour. The consequence is, that the flood is deflected, and it does not fill those harbours, for the Needles entrance is not large enough. When, however, the tide has changed, it runs down first in-shore. Of course, the ebb tide commences first to the eastward. It then sweeps down along the coast of Sussex, comes past Selsea Bill, falls against the Isle of Wight, and fills Portsmouth Harbour, and Southampton Water afterwards.

Mr. BROOKS.—I believe that the supply comes from the back of the Isle of Wight. High water is always earlier on the shore than it is in the offing. You have a greater height of water on the coast at high water than you have out at sea. It is high water at Spithead, Portsmouth, and Langston, before it is high water on the shore and harbours

of the Channel above Selsea Bill, and therefore the supply to Portsmouth must be through the Solent and by the coast tide round the back of the Isle of Wight.

Commander SCOTT.—It is high water below Hurst Castle long before it is high water at Dunnose, and it is high water at Portsmouth two hours afterwards. If you refer to the Sailing Directions of the Isle of Wight, you will find it there laid down as clearly as possible, that on the ebb a great mass of water falls, and is divided by it against the Isle of Wight; and, as a necessary consequence, some portion would run into Portsmouth Harbour, Langston Harbour, and Southampton Water. This really is the case.

Mr. BROOKS.—I differ from you. The Admiralty chart shows it to be high water at Portsmouth before it is high water at Hurst, and, if the body of the tide came down from the Channel in the direction you point out, it would not flow up towards Southampton Water, but would throw itself into a complete eddy. If your view were correct, you would find all shoal water between Selsea Bill and Chichester Harbour. There would be a mass of shoal ground there in Brackenbury Bay.

Mr. PARIS.—Does not Captain Sherringham make some observation with regard to the tides? It has been, I think, already ascertained; and Captain Sherringham has given all the particulars that can be obtained from repeated observations.

Mr. BROOKS.—If you look at the Admiralty Chart you will find it beautifully defined for every hour of the tide.

Commander SCOTT.—Having been inspector of the Ryde district, and having had a cutter there and sailed over the place repeatedly, my impression is, that what I am mentioning is a fact.

Mr. BROOKS.—I must dispute the fact. I do not believe there is any supply to Portsmouth by the ebb tide. The ebb tide is a falling tide, and cannot give it.

Commander SCOTT.—If you will allow me, I will turn to the question of the shoals outside Portsmouth Harbour. You know perfectly well that where you can secure a great run of tide you always have deep water. Now, the cause of the deposit outside is the mud and other things brought down from Portsmouth Harbour. They are not brought in from the sea. It is really the deposit from the land, which is continually being drained off the land and brought down. It forms a deposit on the Spit Sand, and on the opposite space, where there is no clear line of current to carry it away. In the same way, the Mole, stretching along the line proposed, will certainly prevent the free ingress of the water from the east. It must lessen the amount of it; and by so doing it will lessen the velocity through that channel, and have a tendency in the course of time to cause Portsmouth Harbour to silt up. Instead of being an advantage, I should imagine it would be a great disadvantage. The pier can be no protection to Spithead. If you look at the great sea that comes in with the south-east wind, the Mole proposed would not be of the slightest use as a protection to the shipping; nor would it be of any great use as a protection to Portsmouth Harbour. If you notice the tail coming from the end of the Horse Sand you will see it is inclined to the eastward, in precisely the same direction as you say the Spit Sand lies, with the tail to the eastward, which shows that it is brought down from Portsmouth Harbour, the eddy causing a deposit. The obstruction caused by the Mole, instead of decreasing the eddy, would not allow the water to spread fairly, and it would occasion eddies within the turn marked on the map, which would gradually back up inside the breakwater, and spread out into a shoal beyond.

Take again the expense of the Mole. Mr. Brooks sets it down at half a million. Supposing the works marked CCC are not carried out on Portsdown Hill, where will the chalk or other material be procured to form that immense breakwater?

Mr. BROOKS.—You can still get it from Portsdown Hill.

Commander SCOTT.—It seems to me, from the experience we have had with our other breakwaters, that the cost would be considerably more than half a million of money. In every work of the kind it should be considered whether an advantage is gained proportionate to the money laid out. Now, in laying out the breakwater under consideration, it certainly can only be considered as an experiment; and I think it will be a most costly experiment. As to the same causes which have produced these shoals not continuing to act, I confess I cannot see how you can remove them; I do not think you will. On the contrary, I think you will rather add to the existing obstructions. Several times attempts have been made to deepen harbours, under the idea that, having once deepened them, the water will take that direction, and the channel be kept deep afterwards. Such is not the case generally. It has been tried in the West Indies in two or three cases. It was tried by Lord Dundonald, a most energetic man, and he failed in the case in which he

tried it. The only possible way of removing the sands is to have a larger space inside for the water to deposit itself; then, having a larger basin, you would have a greater flow of water, which would carry the silt and other deposits further away to sea, until it got into the fair run of the tide. If you can do that to Portsmouth Harbour, you may then raise it from being a second-class into a first-class harbour. I believe the only way to accomplish this effectually would be to cut through and connect the heads of Chichester and Langston Harbours with that of Portsmouth, so that the water coming through these cuts into the head of Portsmouth Harbour would thoroughly scour out the mud and carry it out into the tideway. Any work placed upon the sands would, it seems to me, produce an entirely different effect.

As to the value of the Mole as a fortification, that is a point I will not go into. My own impression is, that as a fortification it will be of little actual value. Nor do I consider the connecting of the two harbours of Chichester and Langston alone, would be of any practical value. I do not think this would preserve the channel under the lee of the breakwater; I think it would fill up, unless you built an open breakwater: otherwise it would have the effect of raising the sand close against the breakwater, and of causing the bank to extend further out to sea, closing up Spithead.

Mr. BROOKS.—With respect to the last point, that the sands would accumulate under the lee of the breakwater, Captain Scott is perfectly correct. It would accumulate, there is no question; and land would form there from the stoppage of the run of the current.

The CHAIRMAN.—Of the ebb-tide?

Mr. BROOKS.—Of the flood-tide; of what is called the governing tide.

The CHAIRMAN.—It would be on the other side from the flood.

Mr. BROOKS.—That would be counteracted by the vast body of water coming out of Langston Harbour. The triangular space occupied by the Horse Sand would also become land.

The CHAIRMAN.—Do you not think there is an eddy already? There is a formation on that Horse Sand; and by stopping the current that exists now the eddy would be still greater, and there would be a still greater deposit on that sand from the flood-tide. And if there was any ebb on the other side, then there would be a deposit from that.

Mr. BROOKS—It is quite clear.

The CHAIRMAN.—Captain Sherringham shows a current running across both ways with the ebb down channel. He shows a current running across at right angles to that Mole. The current which exists now is very sluggish; it is only a knot and a knot and a half to two knots. That would cease.

Mr. BROOKS.—The current of the ebb shown by Captain Sherringham is the first of the ebb out of Langston and Chichester Harbours, when it is *also ebbing* out of Portsmouth Harbour and setting through the Solent. There is only a knot and a half in Spithead Roads. Now, Captain Scott began with an observation that he believed the Horse Sand was formed by the tide coming out of Portsmouth Harbour. No doubt, there is some formation. But this is a marine deposit. Its chief origin is, the eddy created by the flood tide being deflected from the point off Gosport to the south shore, or the north-east side of the Isle of Wight. The same fact causes the whole of that shore to be comparatively in an eddy, and to be almost useless for harbour accommodation. Chichester Harbour is larger than Portsmouth Harbour, and Langston Harbour is equal to it; yet we find only two feet on Langston Bar, and two feet at low water on Chichester Bar, because the tide is so sluggish. If Captain Scott be correct, that the tide sets so strongly along the coast from the eastward, then you would not have this shoal water existing; it would be all a deep-water channel. All the tidal observations show that the weight of the current is from the west; the other supply is from the south-east; and this Mole offers no obstruction to one tide or the other, except to accumulate the head of the water and throw it into both harbours. And in that respect it would be rather beneficial than otherwise. It would create a shoal on the east side of the Mole, and I should wish it to become shoal. It would be so much the better, because it would prevent gun-boats getting near that coast and shelling Portsmouth. The next observation which Captain Scott made was, that this Mole would have no effect in tranquilising the waves from the south-east. It would have so much, that a wave entering between the Mole and the Warner would immediately spread and settle, and it must have the effect of tranquilising the water within.

Commander SCOTT.—I think you misunderstand me. What I intended to say was, that the erection of a Mole would create an eddy on both the ebb and flow of the tide, and occasion a deposit of sand and mud on each side of it; but, before the effect of such an erection could be estimated, it would be necessary to examine what changes were

taking place, for the Isle of Wight seems to have been once joined to the main land and the channel to have become gradually enlarged by the wash of the tides. By building this Mole you would check the tides and encourage a deposit. As to the Mole tranquilising the water inside, your great sea is from the south-east, and your narrowing the space which is shoal water would have scarcely any effect. Your shoal already breaks the water; and the Mole would do very little more for the anchorage of Spithead. It might tranquilise Portsmouth Harbour a little. But what I wish to point out is, that this Mole could have no more influence as to deepening the water over Portsmouth Bar than it could over that of Chichester. You have spoken of the comparative areas of Portsmouth and Langston Harbours. But you have not taken into consideration the depth. There is considerably more deep water in Portsmouth Harbour; there is a constant stream coming into this harbour which keeps up the depth. Were it not for this large stream coming into it, Portsmouth Harbour would be filled up in the same way that Langston and Chichester Harbours are. On reflux this large volume of salt water joined with the fresh water rushes out with great velocity, and carries the mud out into the main tide; but every obstruction does, by creating an eddy, occasion a deposit, and tends to do harm to the main channel.

Mr. BROOKS.—There is really no disagreement between us. In one part of my paper it is plainly stated, that the Horse Sand would fill up and become land. I think it would be an advantage rather than a disadvantage. If the Horse rises to a greater height, it will have the effect of removing the real bar of Portsmouth Harbour, where there is now only four fathoms of deep water; you will have the bar pushed further out, and, instead of having only four or four-and-a-half fathoms, you will have no bar at all. That I feel positive of. The same works will also have the effect of extending the Spit Sand. That is a bank in the best direction. It is an advantage to Portsmouth Harbour that there is over its bar a stronger current than now exists at Langston and Chichester bars.

Captain BLAKELY.—I have got the sailing directions for the entrance into Portsmouth Harbour. It is as Captain Scott says, The tide runs from the south-east to north-west for eight hours; that is from the rocks due south of Selsea Bill. The tide runs up to Spithead for eight hours, and the other way only four hours.

The CHAIRMAN.—Part of the high water at Portsmouth is due to the first of the ebb down channel two hours.

Mr. BROOKS.—It is ebbing down channel at the time, but the supply does not come from that direction.

The CHAIRMAN.—Coming down channel the water cannot escape at the Needles. The bell-shaped entrance below Spithead will receive a much larger quantity of water than can escape at the Needles; and the necessary consequence is, to have a flow into Portsmouth Harbour until the water has fallen so much outside that the ebb would set in on both sides of the Isle of Wight. It does not ebb both ways round the Isle of Wight at the same moment of time; it does not commence at the same time.

Commander SCOTT.—I would make one more remark, just to sum up what I have said. By carrying out the Mole proposed, you must narrow the passage for the water. The tide coming down the channel along the coast would strike against the Mole; and a large portion of the water that now goes into Portsmouth Harbour, increasing its depth, and on return keeping it clear, would be deflected, and never go into Portsmouth Harbour at all. And, not only that, but the Mole would injure Southampton Water. In fact, the wider you can keep the passage between the Foreland and Cumberland Fort, the better you will preserve both Southampton Water and Portsmouth Harbour.

The CHAIRMAN.—There is a flood that comes in both ways, and an ebb that comes in both ways. That is to say, the flood flows in through the Needles, and it flows in at the east end of the Isle of Wight. The tide also ebbs both ways.

Mr. BROOKS.—It does; but the first of the ebb goes away to the west, and the last of the ebb goes round by the Isle of Wight.

The CHAIRMAN.—But the first of the ebb coming down channel is to flow into Spithead.

Mr. BROOKS.—That I must beg to dispute. Captain Sherringham's chart shows the very reverse. Nothing on this chart shows that there is eight hours' ebb going down that coast by Selsea Bill. Parties mistake for the ebb a current which is created simply by an eddy. Great mistakes are often committed in this way, If you refer to Captain Sherringham's chart, you will see that the ebb tide makes a very different set from what is pointed out. It shows the ebb-tide setting bodily to the south, and the flood-tide, opposite Chichester Harbour, setting away to the north. On the first hour of the ebb there is a current going away to the westward; but that is only the eddy created under Selsea Bill; that is not

the true ebb. The second hour it is the same. Afterwards it returns again to the south. Captain Sherringham is very explicit as regards the supply that fills Portsmouth Harbour. The first four hours it comes from the west, and the remaining three hours from the south-east; certainly not coming from down the channel. I think the mistake originated from the fact of its being ebb-tide in the channel. It is not a channel current that fills Portsmouth Harbour; it is the tide that comes round from the back of the Isle of Wight. No ebb-tide can have the effect of raising water. I never knew it in my experience, at all events.

Captain BURGESS.—Suppose the works on Portsdown Hill marked CCC are carried out, what would be the expense? And what would it be, supposing they are not carried out?

Mr. BROOKS.—If carried out the expense would be under 500,000*l.*

Captain BURGESS.—Would that include making the railway down from the foot of the hill to the shore?

Mr. BROOKS.—That is rather a question for a Committee of the House of Commons.

Captain BURGESS.—Would that sum of 500,000*l.* include the whole?

Mr. BROOKS.—600,000*l.* is my estimate. It would of course depend upon the nature of the construction. If you make the pier 60 feet wide at the surface, instead of 20 feet wide, you of course add to the cost very greatly. An observation has been made about the contraction of the sea-passage by the Mole. Why, the width is 14,000 feet between the Mole and Nettlestone Point; while at Hurst Castle it is only 4,000 feet. There is ample width of water to fill the place, and the width of Portsmouth Harbour entrance is about 600 feet.

Captain NOLLOTH, R.N.—Do not you think that money expended upon clearing out Portsmouth Harbour to get a greater volume of water, and therefore a greater scour at the ebb, would have greater effect in clearing the entrance?

Mr. BROOKS.—The first part of my paper has reference to the removal of the inner bar at Portsmouth. That is quite a distinct work from this: it is merely to give a proper direction to the discharge of the water from Portsmouth Harbour.

Captain NOLLOTH.—But you would get a greater scour if you got a greater body of water in the harbour, than if you scoured at the ebb. Would not 500,000*l.* do more towards getting a scour, by getting a greater body of water, than if you scoured out at the ebb?

Mr. BROOKS.—I have known worse bars than that removed. 14,000*l.* would remove that. They have been very properly dredging it lately, in the absence of any works to remove the cause of the deposit.

The CHAIRMAN.—Then what reference has the Mole to the deepening of the channel into Portsmouth?

Mr. BROOKS.—As I have explained, the only way in which it would have the effect of improving the sea-channel would be by this very deposit in front of Southsea shore. That would enable the waters which are discharged from the harbour to be more concentrated than where they are now diffused over the Horse Sand.

Captain NOLLOTH.—It would be compelled to take this channel?

Mr. BROOKS.—The same as if you were to take a wall down from Southsea; that would have the effect of deepening the channel into Portsmouth.

The CHAIRMAN.—The present channel is deeper than the bank on either side?

Mr. BROOKS.—Considerably more.

The CHAIRMAN.—Then the action of the scour to deepen that must be the last water of the ebb, and that is already confined between the banks.

Mr. BROOKS.—You have all the benefit of the scour from high water. Many parties imagine that the greatest scour takes place at the last of the ebb. In experience I find that not to be the fact. The greater the depth of water the more scouring power you have to maintain a deep channel.

The CHAIRMAN.—It is obvious that the first part of the ebb cannot scour; it is at the top.

Mr. BROOKS.—If you have a body of water to discharge which is twenty feet in depth, it will have much greater effect in scouring out the bottom than if you had only eight. Therefore, if this space opposite Southsea were raised by a deposit, you would have a stronger action upon the channel.

Captain BLAKELY.—I think there can be little doubt in a military point of view as to the defence of Portsmouth Harbour. I do not know whether it would be worth the expense, but the Mole would certainly have the effect of keeping ships off, which now might lie almost with impunity and shell Portsmouth, because six miles is nothing of a range; I do not believe that any works that can be constructed will make it unassailable.

By the time any works are made, guns will be made that will disregard them. In the meantime, as people are determined to spend ten or twelve millions, I think that would not be a bad way of doing it.

Mr. PARIS.—I believe it has always been found that just as the water is slipping off the mud, then is the time it goes fastest, and then is the time when the scour would be greatest. At Langston Harbour—I do not know so much about Portsmouth—the time when the water goes fastest is just after it has slipped the mud, where there is about from two to three feet of water.

The CHAIRMAN.—That is nearly low water.

Mr. PARIS.—No. The rise of the tide in the channel is from fourteen to sixteen feet, but it is only from two to three feet on the mud banks. Just on the first of the tide going away it is very slow indeed; but after it is just slipping the mud then it increases in speed very much. The idea has been suggested that by having a dam on each side so as to confine the water in a narrow neck, it would scour out the channel. I believe something of the kind has been done at Dunkirk. If a bank were formed as proposed by Mr. Brooks it would act upon Portsmouth Harbour in the way I have described. The water being confined would scour out the channel and make it deeper than it is at present. That, I believe, is the object Mr. Brooks wishes to obtain. There is plenty of water in the harbour, seven, six, and five fathoms; but the shallow water is off the entrance, and the more you confine the flow the more you would deepen the channel there. The great thing is to get ships in at all times of the tide. You were speaking about the expense of making this breakwater. It is contemplated to make a railway from Portsdown Hill to the ferry at Hayling Island. Therefore, the material can be brought down from Portsdown Hill; but I very much question whether it will be necessary to fetch it from there, because there is some very high land in Hayling Island, and plenty of earth can be obtained for the purpose of making the Mole. If that railway were made it would materially decrease the expense, because it would be in conjunction with the railway from Havant.

The CHAIRMAN.—We are much indebted to Mr. Brooks for having brought forward this subject. It is a very important one. But I must confess I do not see my way clear. It is, perhaps, not quite in keeping with my position as chairman to offer any comments upon the plan. Still, Mr. Brooks is anxious to have the thing discussed. It is quite true that on the Horse Sand there would be an increased deposit, because of the Mole. It would stop what little current exists there already, and there would be a deposit on each side of it. But in the immediate vicinity to the westward, Mr. Brooks says that the scour from Langston Harbour would keep that passage open. No doubt it would keep it open to the extent of that scour. How far it would be effective in producing a satisfactory channel there, of course it is difficult to say. So far as it produced a deep channel and a sufficiently wide channel it would afford anchorage for vessels, and afford them better protection than they have at Spithead. The size of the vessels would of course depend upon the depth and width of the channel to give them room. To pass on to the question of Portsmouth Harbour: Mr. Brooks admits that there would be a deposit upon the Horse Sand to a greater extent than there is now. Mr. Brooks would not like it to extend, but he would like it to be raised over the existing sand. Now, once you stop the current and increase the eddy, the question is whether you will not form the Horse Sand right across the entrance of Portsmouth Harbour. You will certainly alter the direction of the channel. Undoubtedly, it will narrow it upon the east side of the bank; and the tendency would be to make the outflow from Portsmouth Harbour cut through the Spit Sand. Mr. Brooks might say, that that would be more direct. It is possible it might be so. It is possible there would be a more direct flow in, and a more ready outflow, and that the channel would scour better. There might also be a certain advantage from stopping the current that now passes from the ebb coming down channel, which would be intercepted, and the effect of which up to the present moment is to check the ebb-tide coming out of Portsmouth Harbour at the first quarter ebb, preventing a certain measure of scour that would arise from that. So far that Mole would have a good effect. But then, as I said before, it seems to me a problematical question. There is a danger of putting a harbour of such importance as that in peril by an experiment that one does not know exactly might be successful, at the same time involving so large an expenditure to do it. I contend that the fortification is out of the question altogether. It would be a very serious question to shut up Portsmouth. I do not think we could accept the fortification as a compensation for shutting up Portsmouth Harbour. As that

Mole is so far from Portsmouth Harbour it would be very difficult to say what would be the precise effect as to that. Of course, it would afford considerable protection. I think the great danger to Portsmouth Harbour would not be from vessels coming to shell it; the great danger would be, I apprehend, from vessels coming over with a flotilla carrying troops and making Portsmouth the basis of their operations. There is no doubt the Mole proposed would intercept a flotilla that might be running in to land troops in that direction, and be a protection against deep draught vessels. So far it is an advantage. But then it cuts off your trade there. There is some trade, not much perhaps, but it has its value. As Mr. Brooks has dwelt a little upon Captain Sherringham's testimony, I think I ought to say I have had a conversation with Captain Sherringham, and he tells me that Mr. Brooks has rather misunderstood his remarks on the subject, and his chart on the subject also. He rather disagrees with Mr. Brooks's premises, and, of course, if the premises are not quite right, the principle upon which Mr. Brooks proposes to carry out his work would not be strictly correct. I am a thorough believer in the great value of little groins and little adjustments in directing the current. I have seen interesting results arising from it. I recollect the port of Natal. The water on the bar was 12 feet at low water. By placing wicker-work to arrest the deposit and catch the current, the depth of water in the channel was increased from 12 feet to 18 feet. Nothing could be more simple than that: I do not know whether wicker-work could be employed here. I recollect seeing the case of a river in Ireland showing how much could be done in that way. It was a railway bridge over a river, and this bridge was constantly being undermined. When it came to be inspected, the engineers immediately suggested, "Why, it is no use underpinning this bridge and wasting your money in re-building it. What you should do is to go a little up stream and throw a quantity of stones in there, so as to turn the current of the river and make it shoot through the arches, and all your labour and expense will be saved." No doubt the principle is a good one. The only question is whether it is employed exactly in the right direction here. That is what we are just at issue about; and that turns upon the question of tides. I must say that the last of the flood into Portsmouth comes from the eastward—that is, it is the first of the ebb that flows in there, just as it was described by Captain Scott. It comes down by Selsea Bill, and part flows inside and continues to flow inside until the channel is quite gorged. It cannot escape by the Solent on account of the small opening there is at the Needles; and the consequeuce is that the ebb runs out round the other side of the Isle of Wight.

Mr. BROOKS.—Supposing the coast line extended three miles to the southward, would any one say there would be any difficulty in the water getting into Portsmouth either from the east or the west? or, even supposing the whole of the supply came from the east, would there be any difficulty in the water getting into the harbour?

The CHAIRMAN.—If that was land above water at high-water it would offer an obstruction to the water entering, no doubt. Still, there would be water that would enter that had passed in close to the Isle of Wight. But the case is not so. The land is not uncovered till half-tide, and the consequence is that the first of the ebb flows over it.

Mr. BROOKS.—We are now speaking of the obstructions. Suppose the tide is coming from the east to the west, or the strength of it is coming in that direction, and supposing the line of coast extended three miles to the southward, would any difficulty exist to the passage of the flood-tide into Portsmouth? I think it would enter easily.

The CHAIRMAN.—You mean the first quarter ebb-tide would enter.

Mr. BROOKS.—Yes. Supposing the ebb-tide fills Portsmouth Harbour, I say that, if the line of coast assumed the formation I have described, the ebb-tide would pass more easily into Portsmouth than if you have to encounter the eddy which must be created at the back of Selsea Bill.

Commander SCOTT.—If the Horse shoal were solid land, it would cut off a large quantity of the water that now flows between Cumberland Fort and Nettlestone Point into Portsmouth. Now there is from 12 to 14 feet rise of tide, because there is a large entrance. At Southampton Water there is only 9 feet rise of tide, because there is not width for so large a body of water as that which flows up to Portsmouth. This is, I think, an answer to your theory, and from it we may conclude that the more you narrow the entrance the more you prevent the flow of water inwards, and the more you deflect the current in another direction.

Mr. BROOKS.—If this were all land, you would still have a width of 14,000 feet; and it would be impossible to say there would not be sufficient facility for the tide to enter Portsmouth Harbour, whose entrance is only 600 feet.

Mr. PARIS.—Supposing the Mole were made, the water would still run in and find its way into Portsmouth and Langston Harbours, on the principle that water will always find its level.

The CHAIRMAN.—The object is to have a direct inflow; a rapid scouring current in, and a rapid current out, in a straight line.

Mr. PARIS.—If there is a rapid current in, it clears the channel out. What I was going to observe is, that if the water cannot get along the coast into Portsmouth Harbour, it will go round by the Mole and get in. It will find its level. If the tide is down-flowing, there will be the same level of water in Portsmouth that there is in Langston, because they are both connected. It may be longer coming in, but you get the same level of water.

The CHAIRMAN.—These things are a question of time; and the great scour requires that there should be a quantity of water at the right time. It will not do that if it has to pass in through a narrow channel and to come out through a wide channel.

Mr. PARIS.—You think the water would not get in rapidly enough; that the tide would turn before Portsmouth was filled?

The CHAIRMAN.—There is a difference of time; it will ebb at Chichester Harbour before it does at Portsmouth. What is the plan you propose with respect to deepening the harbour and more immediately getting rid of the bar?

Mr. BROOKS.—The ebb-tide from Portsmouth striking against the quay of Portsmouth is thrown on to the Spit Sand, and is then deflected to the opposite shore. If by any means you can give that a true course down by throwing it into the channel, by that means you get rid of the bar. The most scientific way to go to work would be to make the work inside the harbour to throw the tide away to the westward, and not allow it to run to Portsmouth quays.

The CHAIRMAN.—You would run a dock-wall outside where merchant-vessels lie now, inclosing right up to the dockyard wall?

Mr. BROOKS.—Exactly. That would have the effect; that is the most useful way of doing it.

The CHAIRMAN.—It would be very desirable.

Evening Meeting.

Monday, May 6th, 1861.

MAJOR-GENERAL THE HONOURABLE J. LINDSAY, M.P. in the Chair.

SUBMARINE TELEGRAPHY WITHIN THE LIMITS OF THE NORTH ATLANTIC AND ARCTIC REGIONS.

By MAJOR G. RHODES.

IT is not my intention here to enter into the scientific and intricate details of the theory of Submarine Telegraphy, but, in taking a general practical view of this interesting subject, I will endeavour to convey, for your earnest consideration, some historical, geographical, topographical, and other facts relating to the same, classifying them under the following heads:

1. The Route of the proposed North Atlantic Telegraphic Scheme, geographically, historically, and topographically considered.
2. A proposed New Route of Submarine Telegraphy between Europe and America (connecting therewith England and Gibraltar), geographically, historically, and topographically detailed.
3. The insulating materials of Gutta-percha and India-rubber compared and considered.
4. Concluding Remarks.

I must preface my remarks by stating, that the honour of originating the North Atlantic Submarine line of communication between England and America belongs wholly to Colonel Shaffner of the United States, who, in 1854, obtained a concession from the Danish Government of exclusive telegraphic rights in the Faröe Islands, Iceland, and Greenland. His proposed route is as follows:—

1.	From Scotland to the Faröes . .	250 miles.
2.	„ Faröes to Iceland . . .	350 „
3.	„ Iceland to Greenland . . .	550 „
4.	„ Greenland to the coast of Labrador	600 „
		1750 miles.

Total 1750 miles of submarine cable.

You will perceive that none of the four lengths of cable *exceed* 600 miles, which, electrically, commercially, and nautically considered, are, compared to the 2050 nautical miles of cable laid by the Atlantic Tele-

graph Company (viz., between Valentia and Trinity Bay), infinitely superior.*

The historical information we possess of these northern regions is very interesting; but, I assure you, nothing but a labour of love, combined with an earnest desire, on my part, of acquiring the fullest information, could ever have induced me to continue my research through such a labyrinth of dusty materials. However, I will endeavour to give you some brief details, commencing with the Faröe Islands.

These islands are a triangular group of lofty table-shaped rocks cropping out of the Atlantic, about a third of the distance between the Shetlands and Iceland, and composed entirely of volcanic formations which have been superimposed beneath the depths of the ocean, and, by subsequent igneous convulsion, driven up to, and far beyond, the surface of the sea.

The twenty-five islands of which this group consist are so intimately related in formation and appearance, that they evidently were once a compact mass, in which up-heaval has caused the rents, or rather fiords, by which they are divided. In general, these fiords are very deep, and vary from one to two miles in width, and are parallel to each other. The cliffs, which are nearly all perpendicular, average 800 feet in height, and such, with little variation, save in altitude and extent, is the general aspect of Sandöe and Stromöe.

Thorshavn is the capital and seat of government, and situated on the eastern side of the latter island. It is built crow's-nest fashion, or perched on a slightly-elevated promontory, having one house huddled on the top of, and almost into, another, as if the town allotments were without price. They are all built of wood and coated with tar.

The shores, or rather cliffs, of the Sandöe and Diamond Islets are so steep that *no boat can be kept there;* their sparse inhabitants living in entire seclusion, saving an annual visit from the clergyman, who is hoisted up by ropes. On the contrary, the Islet of Suderöe, situated more to the south, has its deep bays and also basaltic rocks; its climate is more genial, and the produce of its soil nearly sufficing for the support of its inhabitants.

The shores of the bay in which Qualvig, their principal village, stands, are amongst the most picturesque and fertile of the Faröes, and contain some *conspicuous beds of coal.* To the west are the precipitous and weather-worn shores of Vaagöe and Myggenaes, together with numerous rocks and islets.

Eastwards the southern point of Osterö almost joins Naalsöe, and the fiord which intervenes is very dangerous, from its irregular and rapid currents.

Commander Charles S. Forbes, R.N., (to whom I am chiefly indebted for this information,) states that "the wind often arises at these islands apparently without cause or warning, and sweeps down the gullies and fiords with great violence."

To exemplify the rugged nature of this island, I may further mention that a little to the north-west of a large dome-shaped rock called

* On the submergence of the Atlantic Telegraph Cable, see Journal of the Institution, vol. ii. p. 96.—Ed.

Hestöe, within Skaapen-fiord, lays Trothoved, a small detached islet or basaltic rock, which opposes on its western side an unbroken front to the Atlantic ocean of 1,500 feet in height, but on its eastern part slopes gradually down, and only affords shelter and grazing to a small flock of sheep.

With reference to the discovery of these islands, I may mention that an Irish monk, called Dicuil, of the ninth century, especially states in his geographical treatise, "*De Mensurâ Orbis Terræ*," that they had been discovered by his countrymen.

The remarks I have to make relative to the depths of the ocean, &c., between the various landing-places for the cable on this northern submarine route I will defer until I have completed the historical and geographical details. We will now proceed to Iceland, and, having safely landed, I must request your first attention to its historical, and secondly to its geographical, points.

For the earliest reliable information we possess concerning this island we are chiefly indebted to a very distinguished literary Icelander, called Sœmundr, surnamed Feódi, or, the Learned Parson, born at Oddi, in Iceland, A.D. 1056. He, the pioneer of history in the far north, *commenced* the celebrated Book of Chronicles called "The Laudnâmabok," or "Book of Occupation." This celebrated divine left several other monuments of his labours, which have unfortunately been lost.

Amongst the earliest chronicles, "The Laudnâmabok" is the most important, and, although commenced by Sœmundr, was compiled by several trustworthy writers of the twelfth century.

This book informs us that the first Northman who landed on the shores of Iceland was Maddod, a celebrated sea-rover, who, being driven by a violent storm on to the eastern coast about the year 860, entered one of the friths, and ascended a high mountain that commanded an extensive prospect, but, discovering no traces of the country being inhabited, set sail again, after giving it the name of Snœland (Snowland). But some years after another famous sea-rover, a Northman called Floki, went there with the view of forming a settlement, but was obliged to abandon his object, owing to all his cattle having perished during the winter. He bestowed the name of Is-land (Iceland) on the island, in commemoration of having sojourned there during so gloomy a season. It is worthy of remark that "The Laudnâmabok," and other ancient Icelandic documents, state "that before Iceland was settled by the Northmen there were men there called by the Northmen Papy. These men were Christians, and are thought to have come from the west, for there were found Irish books and bells, and various other things, whence it is thought that they were West-men. These things were found in the Isle of the Papy, situated on the eastern coast, and which still bears the same name, and also at Papylis, in the interior; and, further, that the Christians left the country when the Northmen settled there." Dicuil, the Irish monk whom I have previously mentioned, expressly states in his "Geographical Treatise" that Iceland was discovered by his countrymen.

Iceland (which now belongs to Denmark) is one-fifth larger than Ireland, having a superficial area of about 40,000 square miles. It is situated about 500 miles north-west of Scotland, on the confines of the Polar Circle, which bisects its northern extremities, and, unlike any other

portion of the world of a similar size, owes its creation entirely to submarine volcanic agency. At some early period of geological history, the nucleus of this island was thrown up by volcanic power, as Sabrina and Graham's islands were in the present century. The form of the island is that of a flat ascending arch, attaining the elevation of about 754 yards above the level of the sea, near its central point. Its interior, as a whole, is one vast tract of lava desert, and ice mountains—jökulls, as they are termed; these-last mentioned occupy one-tenth part of the island, and never have been and never can be traversed. The habitable coasts consist for the most part of marshy districts, watered by numerous rivers, which descend from the jökulls and lakes, and then pour into the various fiords; the whole extent only affording a bare subsistence for the scanty population. Grain will not ripen in the transient and uncertain summers of these regions, and such like provisions are entirely imported from Europe—even the grass crop is often destroyed by the effects of the Polar ice, which in some years embelts the island (especially on its north and western coasts), causing incessant rain, and therefore an impossibility of drying the hay. Paradoxical as it may seem, there are plenty of forests, but no trees,—such tracts being erroneously so termed by the natives, whereas they only consist of stunted birch-bushes, averaging from about six feet in height, and never exceeding nine.

During the eleventh century, we find that the island was a mere battle-field of internal wars for supremacy amongst the most powerful chiefs, and continued so till the thirteenth century, when, in A.D. 1254, it was surrendered by its own hardy people to King Hakon, and thus, after 340 years of independence, became an appendage of the Norwegian crown.

The history of the fourteenth century is chiefly remarkable for being one of *volcanic* activity, and an unusual accumulation of Greenland ice round the shores of the island, and many earthquakes.

In the middle of the eighteenth century, severe winters followed in rapid succession, inducing a famine, which swept away 10,000 of its inhabitants.

The south-western cape of Iceland (the neighbourhood of which I believe Colonel Shaffner intends as his starting point for Greenland) is called Reikianess, or Smoky Cape. From this point, to some sixty miles out to sea, the volcanic power has from time to time manifested itself, continuing in the same parallel which bisects Iceland in a south-west direction. Islands and reefs have been created and destroyed in those waters, and some detached groups and rocks are still in existence, one of which is appropriately termed the Elld-eyar, or Fire Island.

In the year 1783, famous in Icelandic annals by the tremendous eruption of Skaptar jökull, a submarine volcano burst out of the sea, thirty miles to the south-west of this cape, and ejected so much pumice that the surrounding ocean was covered with it, fish were driven from the coast, and ships impeded in their course. Ultimately an island was formed, bearing three distinct volcanoes. It was claimed by the Danes, and called Nyöe, or the New Island; but before a year had elapsed it sunk, and nothing remained but a reef and rocks, which are from five to thirty fathoms under water. The almost *simultaneous time* of its eruption with that of the Skaptar jökull (a distance of nearly 200 miles apart), clearly illustrates

the extensive and intimate ramification of the volcanic power in those latitudes.

I may here mention that the valuable sulphur range called in Icelandic Gull-bringu Syssel (or gold-bringing country), forms the back ground of the main extending to the north, nearly up to Reikiavik, the capital of the island, and on the south to the small town, or rather village, of Krisuvik. This district (with the refusal to purchase the northern sulphur district), you will be glad to hear is the property of Mr. Bushby, an Englishman, who in 1857 explored it, and then purchased it from the peasant proprietors. For further particulars I must refer you to Commander Charles S. Forbes's valuable and very interesting work on Iceland; nevertheless, I will briefly describe the nature of the *terra firma* of this southern sulphur district. From a little to the south of Hafna fiord (a snug tidal harbour), and on the road, or rather track, to the village of Krisuvik, "the country assumes a picture of erratic ruin; it appears as if it had been baked, broiled, burnt, and boiled by some demon-hand, until its chemical soul had fled, leaving nought behind save a grim grey shroud of darkness and despair." No bird or beast frequents this lifeless range, except near the mud caldrons situated in the Kleisavatn valley; there the grass grows most luxuriantly, affording good grazing for the cattle. The village of Krisuvik is situated at the bottom of this difficult and wild range, distant only about four to five miles from the sea. Returning to Reikiavik, the capital, and proceeding northwards, we find that the coast of Faxe-bay is exceedingly irregular, and beset with numerous rocks and shoals at the entrances of the fiords, especially at and to the north of Borgar fiord; from the latter to the neighbourhood of the crater called Ellborg (the Fortress of Fire), the coast is more regular.

From Nuklaholt (on the usual track for travellers proceeding west) to the town of Budir the distance is about seven hours' journey on pony back, ponies being the only animals of burden in the island. The land track from this point to Budir lies across a series of marshes (extending from the sea to the base of the mountain spur) of the very worst description, or, in other words, is nothing better than quivering quagmires.

On the contrary, the sea-shore, at low-water, consists of hard and extensive sands, usually strewed with balks of timber, borne thither by the great Gulf stream from the American continent. So says Commander Forbes; but, as I shall hereafter refer to the very interesting subject of ocean currents, I will only here state, that that great stream does not approach the Icelandic coast nearer than between six or seven hundred miles. Besides an oceanic stream which brings drift timber from the south-west, there is a north or arctic current which conveys immense quantities of timber from the northern coast of Asia round the north shores of Iceland; and, being checked somewhat in its course by its junction or contact with a south-western current off Faxe Bay, causes this great accumulation of drift-wood to be thrown up on the sea-shore near and in the bay of Budir.

It is by the aid of this timber, drifted here by the will of the all-seeing and all-powerful hand of our Maker, that the inhabitants of these regions are provided with fuel. It is also probable that the extensive beds of *surturbrand*, a species of bituminous coal, found on the north and

western coasts, have been gradually formed by the accumulating deposits of drift timber.

Commander Forbes informs us that "the enterprising owners of the mail steamers are about to make a trial of this coal, and had ordered a supply to be procured from one of the extensive beds now laid bare in the cliffs near Seiders fiord, where it can be shot into a vessel lying beneath."

The small town of Budir is snugly esconced in an ocean of lava, at the foot of a very ugly red conical crater, one side of which has fallen in. Its port is a deep channel worn in the sand by the downward current of an ice-river. Budir is the chief town of that district, and the residence of Mr. A. Thorsteinson, the sysselman, or district magistrate. This port is entirely sheltered from the prevailing north winds, and I would, for various reasons (some of which I have alluded to), recommend it to the favourable consideration of the North Atlantic Company, as their starting point for their section of the submarine cable, with which they intend to connect Iceland with the south of Greenland.

I have already explained to you the nature of the bottom of the sea off Cape Reikianess, together with the volcanic and sulphureous composition of the main land of that south-western district, that it is underneath this cape and adjacent region that the active volcanic power exists; on the contrary, the promontory on which the town of Budir is situated "has not been subject to any volcanic eruption since the memory of man, a few warm waters alone attesting its slumbering powers." Surely this is another reason why this latter spot should be selected as the landing-place for the cable in preference to the district south of Reikiavik, which has, I believe, been considered by the North Atlantic Telegraph Company as best suited for that purpose.

I must now call your attention to the south-eastern portions of the island, immediately above which, and towards its north-eastern extremity, I believe it is the intention of Colonel Shaffner to land the cable, which is intended to connect Iceland with the Faröe Islands. These south-eastern districts are to a great extent occupied by very extensive conglomerations of ice, termed Vatna and Klofna jökulls, occupying a space of no less than 3,000 square miles, and at an elevation varying from 3,000 to 6,000 feet. One of these travelling glaciers (so termed on account of its now occupying what was, previous to the fourteenth century, a fertile and well-inhabited plain) has accumulated and consolidated to such an extent as to form a vast field of ice, about twenty miles in length, by fifteen in breadth, and 400 feet in height. I may also add, that these huge glaciers are yearly on the increase, and gently advancing towards the sea.

With respect to the land portion of the proposed telegraph, I must refer you to Dr. Rae's graphic and interesting description of his explorations undertaken last year, when he surveyed the usual north road, or track of communication, from the east to the west shores of the island.

But to facilitate the carrying out of my proposed western point of departure for Greenland, viz. the port of Budir, I will briefly describe that portion of territory to the west of Dr. Rae's most northern point, when, it may be remembered, that, at about 66° north latitude by 20°

west longitude, he suddenly took a south-western direction, with the view of reaching Reikiavik, the capital.

Proceeding westerly from the above point, the extensive lava desert of Arnarvatnsheidi is shortly reached. It appears that there are two regular roads, or rather tracks, traversing this vast desert, over which travellers can reach the western coast of the island.

This desert waste is totally uninhabited, so that provisions and hay, and in some places even water, must be provided for the ponies, as no blade of grass exists in that exhausted solitude. At their south-western extremities these two routes converge into one, and shortly reach the upper part of the great West Hvita, or White River, and crossing by a ford to the left bank, again branch out in two separate routes, the south-western one proceeding to the north of the great Jhinvalla Lake, direct to the capital; the western one proceeding by the villages of Reykholt and Stafholt, situated in the well-watered, productive, and inhabited valley of Nupe Syssel. From the latter village the road winds in a north-western direction across the mountain range of West Skarsheide, which terminates at the Snœfells jökull, thus separating the Faxe and Breida fiords.

Having now left the great valley of volcanic activity that divides the island, we enter the extinct volcanic district of Western Skarsheide, which only affords a pasturing ground for sheep during the summer months. The next station is Stadarhraun, a small farm situated on the verge of a lava field, and, passing at the base of the extinct crater called Ellborg (the Fortress of Fire), the route verges on the north shores of the Faxe fiord, terminating at the town of Budir.

The object I have in view in recommending this direct western route is to keep clear of the dangerous volcanic south-western district off Cape Reikianess, which, both for land and submarine cables, is to be avoided. From the village of Stafholt (previously mentioned), a land telegraph should communicate with Reikiavik, the capital.

GREENLAND.

It appears from the earliest chronicles containing accounts of the discovery of Greenland, that, "after a period of 120 years from the first colonization of Iceland, Greenland was discovered by one *Grumrbiörn*, who had been driven off the Icelandic coast by successive gales: but he only discovered the mountains, and did not even approach the land.

No further practical notice of this was made until A.D. 986, when *Eric the Red*, a great chief, who was banished or driven out of Iceland on account of the numerous manslaughters he committed, first explored the country, and afterwards founded a settlement that flourished for more than 400 years, records of which were handed down uninterruptedly until the beginning of the fifteenth century.

Eric started from a small island situated at the entrance of Hyams fiord, and in the vicinity of the village of Breidabolstad (about 22½ west longitude and 66 north latitude), where subsequently he assembled the ill-

fated expedition for the colonization of Greenland, of which more than half the vessels, viz., twenty-five in number, were lost.

Eric, or Eirik, gave to his discoveries the name of Greenland, in order to create a favourable impression of its fertility amongst his countrymen and induce them to emigrate; ultimately, not fewer than twenty-five vessels left Iceland under his convoy, but of these only fourteen reached their destination, the rest being either driven back or lost.

The distance between the two countries being little more than 200 miles (so relate the Chronicles), a regular intercourse was established between them, and the number of settlers increased so rapidly, that soon after their adoption of Christianity (about A.D. 1000) a number of churches were built on the *East* coast, and a bishop appointed; he had his residence at *Gardi*, and was a suffragan of the archbishop of Tronhjem, in Norway. A monastery, dedicated to St. Thomas, was also erected at another small town called Albe, and for the period of 350 years a regular trade was kept up with Denmark and Norway.

In the year 1406, the last bishop was sent over to Greenland. Since then the colony has not been heard of, and its loss, or rather destruction, is attributed to the wars then raging between the Danes and Swedes, which prevented the trading vessels, on whom they depended for their supply of grain, from putting to sea.

Previously, viz. in 1350, the colonists had been greatly reduced in *physique* and number by the *black death*, which did not spare these northern latitudes. Another cause was from the Esquimaux, who harassed them with repeated attacks.

With reference to the distance of 200 miles between Iceland and Greenland, in the account which the Icelandic Chronicle gives of the ancient sailing route, it is stated — "that half-way between Iceland and Greenland there was a cluster of little islands, or rocks, called 'Gondebiurne-Skeer,' which were inhabited by bears." Hans Egédé, the celebrated missionary of Greenland, who resided there during a period of twenty-five years (from 1721 to 1746), states—"that the drifting ice has probably collected round these islands, and been so petrified by successive accumulations as to render them in appearance but huge masses of ice, and thus become wholly impenetrable to the melting action of the sun." I gather from the various records and old chronicles which I have examined that the ice has increased, and has been forced much *further south* than it formerly was; and that islands that *then* existed may have disappeared by volcanic action, as is known to take place at the present age; also, from the long dormant state of the volcanic *northern* range in Iceland, we may fairly account for the present immense accumulation of ice and its encroachments towards the south, which volcanic action *alone* can dissipate and destroy.

In looking at the geographical position of Greenland with respect to that of Iceland, it appears strange that the eastern coast of the former, although so near, should be unavailable, or rather unapproachable, for ships, and thus render it absolutely necessary for sailing vessels or steamers navigating between those countries to proceed in a south-westerly direction, and even round Cape Farewell, the most southern point of the mainland of Greenland, before that ice-bound coast can be approached.

Such is a positive fact, and has remained so for ages; but, with a view of confirming the various statements and recent explorations undertaken by Colonel Shaffner and his party, in H. M.'s steamer "Bulldog" and the "Fox," in July and August, 1860, and also to afford some historical information of *earlier* explorations on that eastern coast, I will give you a few particulars.

I gather from the narrative of an expedition to the east coast of Greenland, sent by order of His Majesty the King of Denmark to search for the lost colonies, under the command of Captain W. A. Graah, Danish Royal Navy, that, in the spring of 1829, he proceeded on an exploration to that coast, starting with a small party of Europeans and Esquimaux from the most southernly inhabited missionary establishment, called Friederichsthal, about 44° or 45° west longitude. Arriving at Cape Farewell, which, according to Captain Graah's observations, is in latitude 59° 49′ north, and longitude 43° 34′ west of Greenwich, he proceeded up the eastern coast, employing several of the Greenlanders' boats, called umiaks, of which the outside covering is formed of dried seal-skins carefully sewn together.

Captain Graah states that the usual current from the north-west round Cape Farewell ceases from September to the end of January, and that the sea round that promontory is usually free from ice, or nearly so, from October to January.

Arriving on 23rd May, 1829, at Cape Vallöe, latitude 60° 28′, he found the sea was quite free from ice from about one to two miles off shore, and continued so all the way to Kutek further north. He was informed by the inhabitants that the mainland northwards was always buried under snow and ice, and of European ruins (of which he was in search) they knew nothing, neither did their legends say anything about European inhabitants. Further, that their country had no meadow lands, but at a point called Ekallumiut (further north) were to be found some grass-grown fields; and they all invariably stated "that their coasts were unfit for navigation by ships, as they were constantly beset with ice."

Captain Graah proceeded in his boats northwards (overcoming many difficulties caused by the ice, which even in July still adhered to the coast), and arrived at Sneedorffs Island, latitude 64° 57′ 56″, and longitude 39° 20′, and eventually reached Cape Gudbrand (or Thorlaksen), off which is the island called Vend-om (or turn back), situated at 65° 10′ north latitude. From this most northern point explored by Captain Graah, and at a distance of about 40 to 50 miles east and east-north-east of Vend-om further north, he obtained a sight of two or three large islands. Captain Graah considers from their situation that these islands are the actual "Gunbiorn Skerries" of the ancients (which I have previously alluded to as being situated half-way between Iceland and the ancient East colony in Greenland). According to the early Icelandic sailing directions, to enable you to safely reach the "East Bygd," or Eastern Colony, in Greenland, we find "that, starting from the Cape of Snœfieldness close to the town of Budir, it was four days' sail west, and then lies 'Gunbiorn Skerries,' exactly half-way between Iceland and the Bygd."

The ancient sailing directions of Ivar Bardsen fully agree with those directions. From these and other records Captain Graah is of opinion "that the East Bygd was identical with the present district of Juliansshaab,

for the distance from Snœfields jökull (or Snow mountain) due west to Greenland is 400 miles, and thence to Cape Farewell about 340, together 740 miles, or eight days' sail at 92½ miles." Captain Graah states "that the entire population of this eastern coast did not amount to 600 souls." In further confirmation of the paucity of inhabitants on that coast even at the present day, and the impossibility of the ancient East Bygd or colony ever having been situated elsewhere than in the district of Julianshaab, I may state that the Rev. M. La Trobe, the Moravian missionary residing in London, lately informed me that their missionary station of Friederichsthal was chiefly composed of emigrants from the eastern coast.

I fear that I have somewhat extended my descriptive remarks about the east coast further than was requisite, but I am very desirous of explaining the true cause why on such an extent of coast no safe harbour could be discovered for landing a cable, and also account for the necessity of laying it down passing round Cape Farewell.

Time will not permit of my entering into any details, although but brief, of the various ports, harbours, and missionary stations situated in the districts of Friederichshaab on the west, and Julianshaab on the south, but I will give you a few particulars descriptive of the best harbours or landing stations for a submarine cable situated along the coasts of the latter district, and will confine my remarks to the neighbourhood of Friederichsthal, the most southern establishment of the Moravian missionaries. This station (according to Captain Graah) was founded in 1824, and is considered the handsomest settlement in the whole of Greenland (latitude 60° 0′ 10″, longitude 44° 37′ west of Greenwich). It is precisely on the same spot where the buildings of the present missionary establishment now stand, that anciently stood some of the early Icelandic edifices, and here it is that the missionary and historian Eggers places the most easterly of the Bygds, at Skage fiord.

The mountains about Friederichsthal have a wild and imposing aspect, are of great height, and perpetually covered with masses of ice. There are spacious fields in the neighbourhood, and the soil is favourable for the growth of all sorts of culinary vegetables. This station is subject to terrible storms from the south-east, threatening even the most solid edifices with destruction; but, on the contrary, we find directly opposite, viz., at Tkigeit, at the distance of only half a mile south of Friederichsthal, a small cove with a sandy bottom and sandy beach, suitable as a harbour for small craft.

Captain Graah considers this harbour to be the Sand-haven of the ancients. Should this harbour not be found suitable, there is a good one at the missionary station of Julianshaab, situated further to the north-west; but Captain Graah states that to the west of Kangek (the promontory) is situated the island of Nennortalik, on the east of which there is a good harbour, well protected against the ice by the small islands and skerries lying off its entrance.

I do not think that to the westward of this harbour any others could be safely approached, as between it and the large island of Nunarsoit, which forms the eastern and western boundaries of the large Juliana's Bay, the coast is beset with innumerable rocks, sunken rocks, islands, and no lack of shoals, thus rendering the navigation both intricate and dangerous.

LABRADOR.

With reference to the pre-Columbian, or first discovery, of America, and especially of that part called Labrador, to which I am about to call your attention, the Icelandic historians give the following particulars :

"In the year A.D. 1001 a Norseman of the name of Biorin Herinffson, on a voyage to Greenland to join his father, was driven by unfavourable winds towards the south-west, and discovered a flat, woody coast, which, from subsequent circumstances, together with the original narrative, we may infer to have been that of Labrador. Not being able to persuade his men to land, and being favoured with a south wind, he reached Greenland in six days. Attracted by these reports, Lief, the son of Eric the Red, who had first colonized Greenland, returned to Norway, fitted out a vessel suitable for the trip, and, with a crew of thirty-five men, sailed from Greenland, and reached the coast that Biorin Herinffson had discovered. He continued his course towards the south, and, reaching a strait which separates a large island [I suppose the Strait of Belle-isle] from the main, found a snug harbour, where, the country being fertile and pleasant, he hauled his vessel up, and hutted himself for the winter. He found the climate much milder and the days longer than in Greenland. On the shortest day the sun was above the horizon from *dagmal* to *eikt*—that is, from 7·30 a.m. to 4·30 p.m.—making the day equal to nine hours, and consequently placing his position a little to the northward of the present site of New York. A South countryman, called Tyrker, one of the crew, wandered into the interior, and found quantities of wild grapes, whence they gave it the name of Vinland. A few years after a colony was planted on these American shores by Thorfin, an Icelander, and a regular trade with the natives in furs, skins, &c., was established. Records were carried down to the twelfth century, when a Bishop of Greenland visited the colony, and promulgated the faith; but since that period the fate of the colonists is lost in conjecture."

This early record of the discovery of America is very interesting, and I considered it worthy of notice, because it proves that the continent of America was known to Europeans nearly 500 years before the Genoese mariner set his foot on its shores in A.D. 1492. Even the great Humboldt, in his "Cosmos," believes that Columbus visited Iceland in the spring of 1447; that he started from Bristol, between which port and the north a considerable trade then existed; and that he then acquired the necessary information which induced him to cross the Atlantic ocean. Although we find that the coasts of Labrador had been discovered in the year A.D. 1001 by Biorin Herinffson, still the Portuguese lay claim to its more modern re-discovery, and called it by that name.

This country is one of the most barren in the known world; thus its sea-coast is remarkable for its great sterility. On its northern and eastern parts mountains rise suddenly out of the sea, producing but a few stunted spruce and other plants. Innumerable islands encumber its northern shores, and, as many of them are at a considerable distance off the main land, a ship of burden would sail a considerable way along the coast without forming any notion of its true situation. The navigation is consequently extremely hazardous, especially near the main, as the sea is

covered with large bodies of broken ice; and the further you proceed northward the greater is the quantity. The climate is extremely rigorous. The summer commences about the middle of July, and the winter about the end of September. All along the coast there are many rivers; but most of them are nothing better than broad brooks or rivulets, such being only drains or streams from the ponds.* In dry weather they are everywhere fordable, having a solid rocky bottom.

The Rev. Mr. La Trobe informed me that the Moravian missionaries have only four stations on the northern coast, viz., Nain (chief station), Okkak, Hebron, and Hopedale, all situated to the north of Hamilton Inlet. The coast inhabitants consist entirely of Esquimaux, who appear to have emigrated from Greenland about the middle of the last century. Lieutenant Roger Curtis, R.N. (to whose narrative I am indebted for the above information, dated 24th February, 1774), estimated their numbers from 1600 to 1700 souls. He says that a totally different race of savages inhabit the interior, which is still less populous. The latest reliable information I could obtain about that comparatively unknown coast, is to be obtained from a perusal of "the proceedings of Captain Hercules Robinson," and an inspection of the charts he sent to the Admiralty,—being results of a "surveying summer cruize" he was ordered to perform when in command of Her Majesty's ship "Favourite," between 4th May and 26th October, 1820.

I may here state that the coast was surveyed from the Strait of Belle-isle to and including Sandwich Bay Full details of the depth and nature of the bottom of the various bays, harbours, &c. besides some account of the natural productions on the coast, with several other particulars, have been given.*

I shall defer entering into the interesting subject of the various currents and soundings of this north submarine route, until the reading of the concluding sections of my paper.

Extracts from Professor Wheatstone's Reports.

Indian-rubber and Gutta-percha considered as an insulating medium for coating wires for telegraphic purposes.

I can but very briefly refer to the above interesting subject, at this stage of my paper, as I intend to enter fully into the matter when I read the remaining sections.

I believe it is generally known that the above two substances have been for some considerable time antagonistically employed by competing manufacturers for the purpose in question.

With a view of setting at rest this vexed and long-disputed point (viz., as to which substance is best adapted for the coating of submarine cables), several of the most eminent electricians of the day (including Professor Wheatstone) have been examined before a Parliamentary Committee. I have been favoured with a perusal of that eminent Professor's printed report, and thus I am in a position to afford you some valuable information.

* Philosophical Transactions, 1774. † See Nautical Magazine of 1851.

It appears that seven manufacturers furnished him with a sample of their coated cables, and, having carefully tested each separately, the Professor records as follows:—

1. That Indian-rubber surpasses all other materials in the smallness of the amount of its inductive discharge and the *perfectness* of its insulation.
2. A coating of Indian-rubber is fully equal to a gutta-percha coating of *double* its thickness.

With regard to the influence of temperature on the amount of discharge, he says Messrs. Silvers' Indian-rubber maintains an insulation almost perfect up to 92° Fahrenheit, whilst gutta-percha is very considerably affected. Again, Silvers' Indian-rubber retains its high insulation, with little or no change, and preserves nearly the same *amount of discharge* from 32° Fahrenheit to 165° Fahrenheit.

I beg to say that I have only quoted the *best* results, as contained in that Professor's official report.

Colonel SHAFFNER, United States.—I am very much gratified with Major Rhodes's description of the features of the North Atlantic route. I have nothing to add in the way of correction of what Major Rhodes has said, and what I may say will be rather in extension of his remarks. My experience is based upon two surveying voyages which I have made upon that route. The first in 1859, starting from Boston, I went north to Hamilton Inlet, on the Labrador coast; there I anchored, and made examinations of the coast so far as I could with the length of time at my disposal. I then proceeded to Greenland, went up the coast and down again, and anchored off Kaksimiute, and then with small boats examined the fiords and harbours. There are thousands of them in that part of Greenland. Having finished my examination there, I sailed round to the east coast, to a place a little above Cape Valloe. I went near the shore, and at that time there was nothing to prevent my landing. Then I proceeded across to Iceland, but the heavy gales of November 1859 prevented me from extending my voyage further, and I came on to Glasgow. The next voyage was in the "Fox," last year. We started from Southampton, and went to the Faröe Islands, and I accompanied Dr. Rae from the town of Thorshaven across Stromöe to the northern part, to Haldervig. Thorshaven is a town of about 900 inhabitants, well educated, a very fine people. I was very much pleased with them. They are very industrious, and their business consists principally of fishing. In Stromöe it is a little hilly, but it was not very difficult to get over. We could have ridden over with perfect ease, as there was a good horse-road. We preferred to walk. From Haldervig we went to East Iceland, and I accompanied Dr. Rae on the journey across Iceland pretty much as described by Major Rhodes. We left Iceland, and starting from Reikiavik in the "Fox," we went direct across to Greenland, and descended the coast. The wind took us out, and then we came round to Juliansbaab. We went due north to Friederichshaab, and stayed there some days. We came down again, and, having finished our observations in South Greenland, we returned to England. As regards a few details, I may state that our journey across Iceland was a very pleasant one. The distance traversed was 450 miles, and the journey was made in fourteen days, on horseback, averaging from twenty-five to thirty-five miles a-day. The travelling was very good. The roads were tolerably good, and we could ride with the greatest facility. For many miles there was green grass as far as we could see. We found water every few miles. There was no difficulty with regard to water or grass, except perhaps in the interior of the island, for about eighty miles in length. Here there is not so much grass, though there is plenty found for horses every ten or fifteen miles. At night we turned them out to graze in the large meadows. A rude waggon-way could be made across Iceland with very little expenditure. The Iceland parliament has appropriated a sum of money to be used for the construction of highways in different directions, so that, should we construct a line of telegraph across the country, the government will make the road at the same time. We have no apprehensions at all from volcanoes. Eruptions do occur once in fifty or

a hundred years, but in the regions we traversed there need be no apprehensions upon that subject. If we should not desire to go to East Iceland then we may go to Portland. It has not yet been determined which we shall go to, whether to Beru fiord, on the east side of Iceland, or to Portland, on the south. If we go to Portland, then we shall run across the land to Reikiavik. The whole of this region is thickly settled. I might observe that in nearly the whole course of the journey we found the country settled. We stopped at farmhouses, and had every accommodation we could desire—much better than we find in many of the western states of America. It is not proposed to carry the line along the supposed dangerous sea south of Reikianess, but to run from some part of Faxe Bay in a direction of which we have a line of soundings from one hundred to two hundred and fifty fathoms, away beyond that part of the sea which is supposed to be subject to volcanic eruptions. After getting to Greenland it is not proposed to land on the east side, but, as Major Rhodes says, to run round to some point on the south-west side, perhaps to Julianshaab fiord, or to one of the many other fiords. There are some thirty or forty deep fiords that run up into the country thirty, forty, and fifty miles. These fiords, commencing at a point twenty miles from the sea, are 150 fathoms deep, and running out into the deep sea in enormous trenches, till we get from five to ten miles from the coast proper, are from 300 to 350 fathoms—a depth far beyond any ice that ever comes into that region. Thence across to Hamilton Inlet, on the Labrador coast. The soundings taken by Sir Leopold M'Clintock give 180 fathoms in the interior of the outer rocks. So we have no fear of any ice there, and the cable will be sufficiently protected.

Dr. WALLICH.—I am afraid my remarks will be so mixed up with the natural history department, which I had under my charge, in the recent survey by the "Bulldog," that I think I had better reserve them till the next paper is read. There is only one point upon which I would touch connected with natural history, and that is the drift-wood of the coast. Major Rhodes says he suspects the drift-wood came up from the Gulf stream towards Iceland. With all due deference to his opinion, I can hardly believe it is so; because I am not aware of any instance in which drift-wood has been found in any *quantity* midway between the southern point of Greenland, Cape Farewell, and the Iceland coast. It has been generally asserted that the drift-wood comes down from the northward, brought round by the northern arctic current, passes along the shore to Cape Farewell, and then up the east coast of Greenland to Iceland. It is not known where it comes from; and I rather think there is no instance of drift timber crossing over in a *north-easterly course from the Labrador or American shores.* With regard to that species of coal which is found on the north-western coast of Iceland, I have in my possession a small piece, and I have examined it. It was given to me by an able and intelligent physician of Reikiavik, as a good average specimen of the material that is found there. From the experiments I have made, it does not appear to contain a single particle of bitumen. It will not burn, but will get red hot, and gives the slightest possible flame. If the coal found in any quantity be of the same species, it will never suffice for any economical purpose. I may have received a sample which is not a fair average specimen, but, if I have, I can only say it can never be used for any of the ordinary purposes for which common coal is so well adapted.

Major RHODES.—I beg to make one remark with reference to what Dr. Wallich has been kind enough to say. What I stated about the south-western current coming up from Greenland, was quoted from Commander Forbes's recent work on Iceland. It was also from that source that I obtained the information (so far as I remember) about the coal found on the coast. Not having been in those parts myself, my statement is only a collection of information extracted or obtained from the works of, or direct from, travellers who have visited those parts. With respect to the drift-wood, Commander Forbes says that the great *Gulf stream* brings the timber up this coast, and then another stream comes in contact with it, producing a sort of eddy; and thus drives the drift-timber into the Faxe fiord. In my next paper (which I hope to read on the 19th of June), I shall show that the great Gulf stream does *not* wash the southern shores of Iceland; that there is another current, 600 miles in width, which runs direct down the coast of Labrador, meeting off the northern coast of Newfoundland the great Gulf stream, which latter is a warm stream, and thereby causing it to diverge in a south-south-easterly direction, passing through the Azore group of Islands down to Madeira. The Gulf stream does not either water the shores of Ireland or Scotland, as is generally supposed. As I shall make some remarks about the oceanic currents and

winds in those latitudes on a future occasion, it may be as well not to dilate too much on that subject on the present occasion.

C. WEST, Esq.—I shall confine my remarks to the latter portion of Major Rhodes's paper, and in confirmation of the Report of Professor Wheatstone, which, though it has not yet been presented to the House of Commons, I know the purport of. I know that Professor Wheatstone has given his earnest attention to the comparative merits of the two modes of insulation, that by "gutta-percha," and that by "India-rubber;" not only in the public experiments that have been made by order of the Government, but in the private experiments he has been making at his own domicile. I was interested in some experiments made years ago, when it was not so fashionable to speak of India-rubber as it is now; and that was the insulating medium I used when I first laid down the cable across Portsmouth harbour; the insulation of that cable is now as perfect as it was in the year 1846, when I laid it down. It has also stood the various tests of temperature. I have had it in boiling water. I have mentioned this before; but I mention it now only in corroboration of the tests that have recently been made by practical and eminent scientific men under the order of Government, with the view to ascertain correctly which is the best mode and material for insulation; so that hereafter any important projects which may be carried out shall not bear the same fruitless results that have unfortunately befallen the Atlantic, the Mediterranean, the Red Sea, and the Gibraltar cables. In corroboration of what I have stated, as to the advantage of India-rubber as an insulating medium, I would call your attention to a portion of a cable I here exhibit which has been laid down for years. The outside wire was not galvanised. You will perceive that it is platted on, and not worked spirally round, like the other cables have been; moreover it is a compound cable. There are also four insulated wires, so that if there were anything like a tension, while the outer covering would expand, the inner insulated wires would not alter, because the latter are formed in the shape of a four-strand rope; whereas the wire that was laid down across the Atlantic was a single wire covered round spirally with iron wires. Consequently, when there was any tension upon it, the whole strain was upon this single wire, and being such a very small substance, it naturally, in most instances, broke. And where it did not break, still the tension would cause the insulating medium (however perfect the insulation might have been in the first onset,) to become imperfect, and allow the permeation of water through it. After it had been laid a few hours it was reported to be faulty; in a few days it was worse; till eventually, after a month, it was reported to be of no use whatever. All its insulating powers had been lost, and I attribute it to the causes which I have stated.

The CHAIRMAN thanked Major Rhodes in the name of the meeting for his very interesting paper, and also Col. Shaffner, and the other gentlemen who had addressed them.

Wednesday, June 19th, 1861.

Rear-Admiral J. RIVETT CARNAC, in the Chair.

On Monday, 6th May, I had the honour of reading the first section of my paper on "Submarine Telegraphy within the limits of the Arctic and North Atlantic Regions," and now, by the kind permission of the Council of this Royal Institution, I again venture to offer some remarks on this very interesting and *international* subject.

Before entering on the description of my "proposed *new* route of Submarine Telegraphy between Europe and America," I beg to state that I do *not* bring it forward as an antagonistical scheme (although it is in reality one of that nature), but with the view of humbly affording some further information, and thereby facilitating the operations of, I trust,

future projectors. I believe that Submarine Telegraphy will *eventually* be as necessary to the great onward progress of our present civilization, as railways have proved themselves to be the fathering and fostering medium of our noble and enlightened literary penny-postage system.

The iron rail has progressed, in this free and happy land, far beyond our expectations, and, as you are well aware, battles have been fought and nobly won by the numerous army of projectors.

The campaigns of Submarine Telegraphy have, in their turn, to submit to similar, and perhaps I ought to say more serious, obstacles. The bed on which cables must lay, is unseen to the eye of man, and is perhaps more irregular than the visible crust of this terraqueous globe: it thus behoves us, as the leading nation of the civilized universe, to combine morality with our accustomed energetic actions. We shall eventually succeed; but such success is never of any permanence unless accompanied by pureness of materials, and honesty in their combination.

I think you will agree that suitable competition is both wholesome and necessary for success; therefore I will proceed with my proposed new route, which is as follows:—

1st. From the north-eastern side of the Land's End, at Mount's or St. Ive's Bay, to the northern coast of Portugal, off Cape Rivos, which is the most southern point of the river Lima—distance 542 miles.

2nd. From the Bay of Lagos, on the south of Portugal, to Porto Santo Island—450 miles.

3rd. From Porto Santo to St. George on the north coast of Madeira—31 miles.

4th. From Madeira (north side) to the Island of St. Miguel—525 miles.

5th. From Madeira (north side) to St. Mary's—460 miles.

6th. From St. Mary's to St. Michael's—55 miles.

7th. From St. Michael's (north-west point) to Angra, Terceira—67 miles.

8th. From St. Mary's to Angra, Terceira—140 miles.

9th. From Terceira to Graciosa—25 miles.

10th. From Graciosa to St. George—20 miles.

11th. From St. George to Fayal—10 miles.

12th. Fayal to Flores—120 miles.

13th. From Flores to St. John's, Newfoundland—1,050 miles.

Grand total of geographical miles required for submarine purposes, between England and America, *viâ* Portugal, Madeira, and the Azores, to Newfoundland, 2,830 miles.

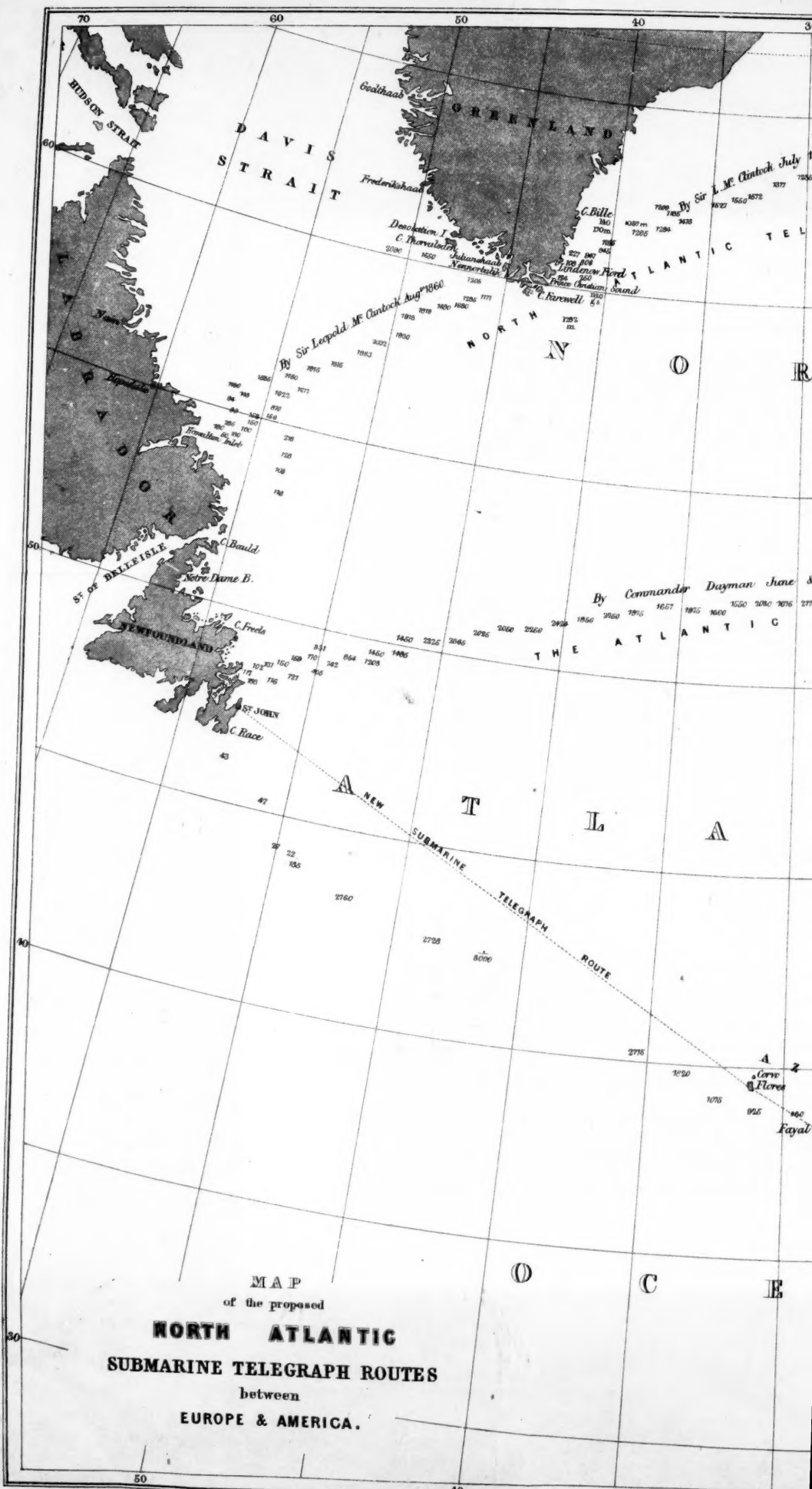
Length of submarine cable between England and Gibralter, *viâ* river Lima, and from the Bay of Lagos direct to Gibraltar, 703 miles.

From England to river Lima, and from the Bay of Lagos to St. Lucar, on the Guadalquivir river—656 miles.

From England, *viâ* river Lima, and from Bay of Lagos to Cape Trafalgar, 665 miles.

Total length of submarine cable required 665 miles.

I find, on referring to the soundings and nature of the bottom of the sea (as recorded on the Admiralty charts), between the Land's End and Cape Nivos (north of Portugal), that they are generally favourable for the safe deposit of a cable; and by steering in a south-westerly direction, so as



MAP

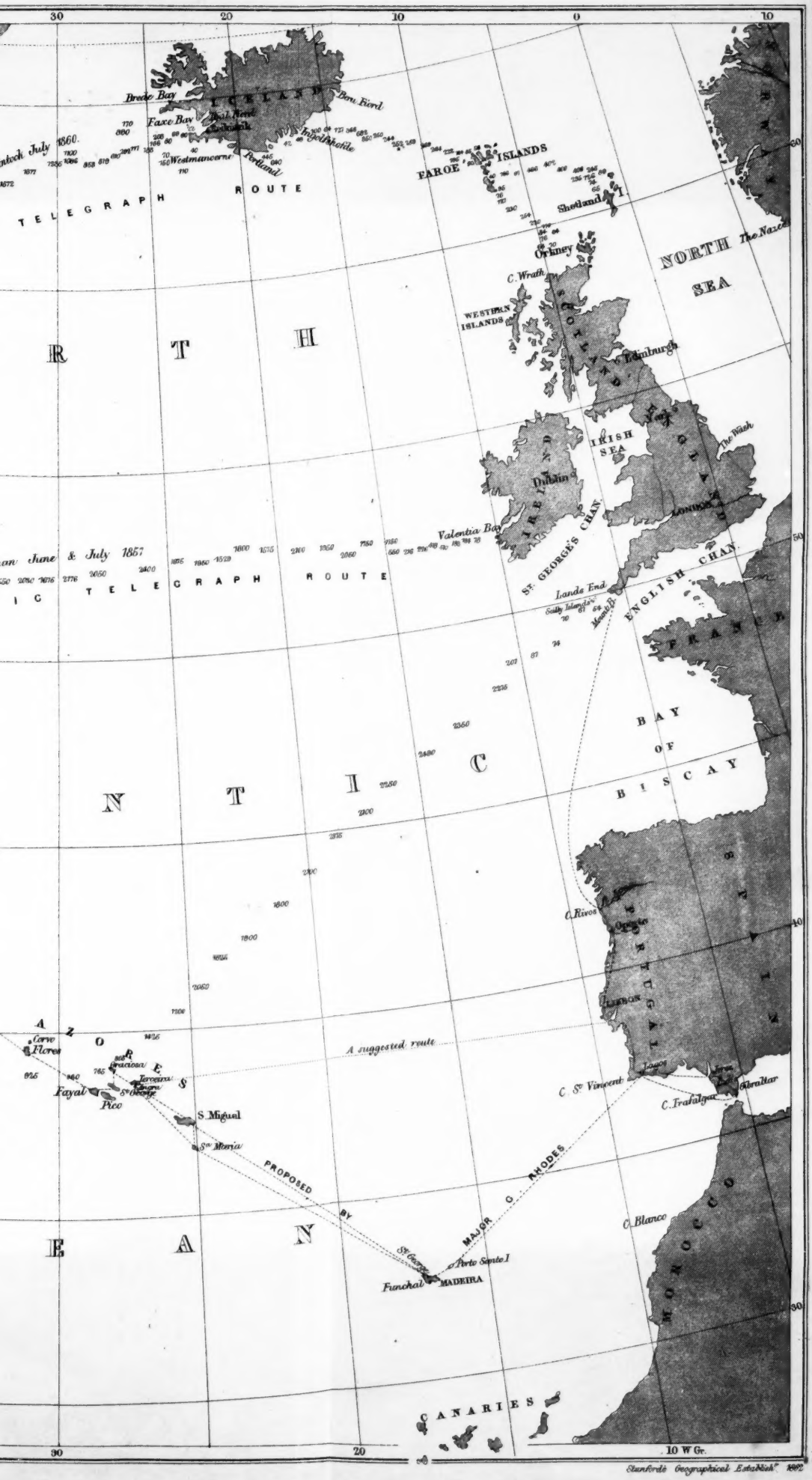
of the proposed

NORTH ATLANTIC

SUBMARINE TELEGRAPH ROUTES

between

EUROPE & AMERICA.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Bredo Bay
ICELAND
Faxe Bay
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Westmanoerne
Portland
Berufiord
Djupivogr
FAROE ISLANDS
Shetland I.
TELEGRAPH ROUTE
Orkney
C. Wrath
NORTH SEA
The Naze
WESTERN ISLANDS
SCOTLAND
Edinburgh
IRISH SEA
The Wash
Dublin
IRELAND
Valentia Bay
ENGLAND
ST. GEORGE'S CHAN.
Lands End
Scilly Islands
ENGLISH CHAN.
FRANCE
BAY OF BISCAY
C. Rivos
PORTUGAL
Lisbon
Corvo
Flores
A suggested route
Fayal
Pico
Graciosa
Terceira
S. Miguel
Ste Maria
C. St. Vincent
Gibraltar
C. Trafalgar
PROPOSED BY MAJOR G. RHODES
C. Blanco
MOROCCO
Porto Santo I.
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Stanford's Geographical Estabish.t 1862

to keep westward of the Bay of Biscay, as also to avoid the rugged coasts of Spain, at its north-western extremity, the northern coast of Portugal can be approached, and there, at Cape Nivos, we find a suitable point to land the shore-end of a submarine cable.

Before proceeding on my land journey down the coast line of Portugal to the Bay of Lagos, previously mentioned, I may be permitted to state, that the commonly received opinion on the etymology of the word "Portugal," is, that a great number of Gauls landed at Porto, or Oporto, whence it received the name of Portus Gallorum, or the Port of the Gauls, and that in process of time the name gradually extended over the whole country, being softened, or rather shortened, into Portugal. According to the geographer Ebeling, the length of Portugal is 301 geographical miles, having a coast line of nearly 500.

It is part of my scheme to carry a land telegraph down that coast, the wires to be suspended on poles; and, where rivers or other difficult points may present themselves, to be prepared or coated for submersion, or subterranean deposit. I would prefer landing the cable on the north shores of Portugal for several reasons; amongst which I may mention that the Portugese have long been our faithful allies, and that I conceive that in a geographical, commercial, and strategical point of view, the low and flat shores commencing at the River Lima, and continuing a distance of about ten miles below Villa del Condé to the rocks named Leichoes, as best suited for the purpose in question. France, Germany, and the other European states, have already a continuous land telegraphic communication with Portugal, but England has not. Should it ever be the misfortune of the present generation to witness a general European war (which may God Almighty be pleased to avert), our sea-girt island would be cut off from direct communication with Gibraltar, and our other very important military and naval stations in the Mediterranean. For the security of these valuable outposts, which we hold for non-aggressive purposes, I think most Englishmen will concur, that it is the bounden duty of our Government to either lay a submarine cable between England and Portugal, or guarantee a suitable per-centage to any English company who would undertake to do so, such per-centage to be only paid during the actual electrical working of the submerged cable, but that every possible assistance should be freely afforded for its protection, either during peace or war.

It would be both tedious and practically unnecessary that I should describe the Portugese coast in detail, I shall therefore only give a general outline: Between Oporto and Aveiro the coast line is very flat, and to the south of Cape Mondego the soundings are from 20 to 30 fathoms, with a brown sand and shelly bottom and a flat and sandy shore. In Estremadura it is in one part steep, and in another almost a dead level, and very insecure. In Alemtejo (south of Lisbon) it is generally low, but full of rocks and shallows. At Cape St. Vincent (the most south-western point of Portugal) the shores are high and rocky, but as we proceed towards the Spanish frontier they sink into low and sandy downs. Returning to Lagos, we find that its bay is clean and capacious, with a low north beach, and within less than a cable's length from the point Piedade there is a depth of nine fathoms. Off Cape Santa Maria the soundings are generally sandy. At about one mile off shore there are nine fathoms, and at a league from 80 to 90, and

a little farther out, no ground at 150 fathoms. This Cape is the most southern land of Portugal (36° 55′ N. latitude and 70° 50′ longitude west of Greenwich). Proceeding eastward towards Gibraltar, we find between the rivers Guadiana and Guadalquivir that the coast is low and sandy, and that every stream has its bar of sand.

From Cadiz to Cape Trafalgar, which latter in 1805 was a silent witness of one of our most glorious naval victories, the coast line is generally very rocky, and consequently extremely dangerous. On rounding that cape, and proceeding for a short distance nearly due east, there is found a patch of land named "Bogueron," and at nearly one mile east by south from the tower of Cape Trafalgar the beach is low, and has a small creek with some rocks lying before it; this is called the "Barcadero" of Meca. Vessels may anchor off this place in a convenient depth, and on clear ground; it is well sheltered from north-west, north, and north-east winds. Fresh water can be obtained here. Between this creek, Tarifa Point, and the Bay of Gibraltar, it does not appear advisable (from the information I have obtained) to land a telegraphic cable on those shores. I shall therefore propose for your consideration three points on the Spanish coast for the above purpose;* pre-observing that the passage from Cape St. Vincent to the east towards Cadiz is considerably influenced by the tides and currents, the set of which no one pretends to understand, and therefore great caution is necessary in the navigation of those waters.

Starting from or near the Cape of Santa Maria in Portugal I would,

1. Land a cable on the sandy coast near to the embouchure of the River Guadalquivir, and then connect the cable with the existing land electric telegraph at the town of Jerez de la Frontera; thus opening direct telegraphic communication to the south with the great commercial port of Cadiz, thence to the north with Madrid and the whole of Europe.

From Jerez de la Frontera the telegraph wires should be continued to Gibraltar.

It may not be generally known that England is at present in electrical communication with that fortress (or nearly so), as there is a telegraph station within a few miles of the Rock; but, owing (I presume) to the ever jealous and still co-religious political ideas which injuriously dominate over the inhabitants of that rich and favoured land, the project of extending the wire to Gibraltar does not appear to meet with the approval of the Spanish Government.

I have lately been informed that frequent telegraphic messages were sent to England by the governor of that station during the recent Morocco war.

2. The second point I propose for landing a cable would be at the small creek named Barcadéro.

3. The third point should be the Rock of Gibraltar.

* See the Nautical Magazine, 1840, p. 761.

The soundings and intricacy of the bed of that strait I will not attempt to describe; not that its nature is unknown to our gallant sailors, but I fear, from the information we at present possess, that no practical utility would result. The object I have in view is to afford accurate information, and to propose routes which I believe may be carried out, and at the same time afford the greatest benefit to the commercial world; that each length of submarine cable should possess sufficient local traffic so as to realise a fair amount of earnings, irrespective of the occasional accidental stoppages of the other submarine links to which they may be connected.

Supposing (as I fully apprehend) that the Spanish Government will not consent to have her telegraphic wires linked to those of England, thereby aiding in strengthening that military and strategical stronghold which we possess in those waters, still a very important advance would be obtained if we only could have direct telegraphic communication from England to the Bay of Lagos, on the south of Portugal: the distance from thence to Gibraltar, by the aid of powerful steamers, would be but a few hours.

We must now return to the Bay of Lagos, and from thence proceed to the group of five islands called the Madeiras, of which Madeira and Porto Santo are the most important; the distance is about 450 miles.

These islands are situated between latitudes 32° 23′ 15″ and 33° 7′ 50″ north, and longitudes 16° 13′ 30″ and 17° 16′ 38″ west of Greenwich. The name "Madeira" was given to the principal island by João Gonçalves Zarco (the Portuguese who discovered it in A.D. 1419), in consequence of the great quantity of timber growing on it. It is sometimes poetically called "The Flower of the Ocean." Its length is about thirty-one miles by twelve in breadth, and at Pico Ruivo its height is from 5,993 to 6,056 feet above the level of the sea. From its mid-tropical situation the climate is of a very mild and healthy nature; and is therefore the winter resort of invalids, generally those afflicted with pulmonary complaints. The mean temperature of the island during the hottest months, viz. August and September, is between 73° and 74° Fahrenheit; but, when the south-eastern winds bring the hot air from the African desert, the thermometers sometimes rise to 85° and even 90°. According to a recent census, I find that Funchal, the capital, situated on the southern coast, contains about 30,000 inhabitants; and the population of the entire island is calculated at about 110,000 souls. In a commercial point of view this island is of great value, as it is a calling station for vessels of all nations, and has twenty-five consular agents. In 1857, the number of outward and inward bound vessels amounted to 544 and tonnage 109,740. The number of English vessels alone which entered the open port of Funchal in 1854 was 107, and value of cargoes £68,400. The revenue from the customs for the year 1857 alone amounted to £18,762 on 14,445 pipes of wine exported.

The island is evidently of volcanic origin, and, among its numerous minerals, gold has been recently found. Its shore formation consists generally of lofty cliffs; but situated on the north coast, and westward of Ponta Furada, is snugly ensconced a small bay, with a fine sandy bottom,

in which there is smooth-water anchorage when the wind is from the north-west and north-east, and tolerably easy landing. Its width is about one mile by three-fifths in depth, but only available for steam-vessels. Should this bay not be found to be a suitable landing-place for the shore end of the submarine cable, there is also a sandy beach to the east of Point Canical.

As the small island of Porto Santo (33° 3′ north latitude and 16° 20′ west longitude from Greenwich) is nearer to Portugal, I would recommend that that long link of cable should be landed there, electrically connecting this to Madeira by a shorter one. This island is about seven miles long by two and a half in breadth, and its soil is extremely fertile. Ships can ride at anchor in its open harbour, except when the wind is from the southward, and is considered a much safer anchorage ground than that of Funchal; for this reason it is often visited by outward and homeward bound Indiamen.

I fear I may have somewhat fatigued the kind and patient attention of my audience in dilating on dry statistical details; but, in considering the question of submarine telegraphy, traffic—and especially local traffic, such as telegraphic messages—must be very carefully and fully examined. If sound commercial principles were invariably adhered to, and mere speculative and imaginary schemes avoided, we should have much less occasion to deplore the numerously-occurring failures.

We must now proceed on our submarine journey towards the north-north-west, where, at about the distance of 525 miles, we reach the Island of Saint Michael, the largest, most populous, and fertile of the nine islands which collectively form the Western Isles, or Azores. It appears that the earliest chroniclers who mention this group are the Arabian geographers, Edrisi and Ibn-al-Vardi, who state "that, besides the Canaries, there are nine other islands situated in the Western Ocean, and that they abound with a species of eagle or hawk." At the time of the re-discovery of these islands by the Portuguese—viz. in A.D. 1439—an innumerable quantity of goshawks (*falco palumbarius*), called by the natives "açor," were found there; and thence we have the Western Isles of the Arabian geographers and the Azores of the Portuguese.

The volcanic formation of the Island of Madeira extends throughout this entire group; but the topographical nature of St. Michael's Island is far less mountainous and irregular than the former, consisting generally of a fertile plain, diversified by an infinite variety of hills and mountains. Luxuriant crops cover the plains and valleys; the hills are adorned with vines and orange-trees; the mountains are also clothed with myrtles, laurels, and a variety of evergreen shrubs. Hot springs abound in every part of the island. The caldeiras, or boiling fountains, are the most remarkable; they have been much resorted to during the last fifty years, affording considerable relief, and often a complete cure, to invalids afflicted with palsy, rheumatism, and even gout. Besides producing two annual crops of wheat, barley, Indian corn, &c., this fertile island is abundantly watered, and contains several large deep lakes, well furnished with a variety of water-fowl. The roads in the valleys and plains are generally smooth and easy, which is a great contrast to the nearly roadless

island of Madeira. The climate is very mild, varying from 46° to 76° Fahrenheit during the winter, and 46° to 84° Fahrenheit during the summer; consequently it has a nearer affinity to that of Europe than to Africa. Dr. Mason states "that for scenery and cultivation St. Michael's is far more interesting than Madeira, and better calculated for invalids requiring exercise in the open air; and that its capital, Ponta Delgada, is better built and cleaner than Funchal." Dr. Bullar, in his description of the Azores, has recorded some valuable information with respect to the climate of St. Michael's, which I consider too important to be omitted. The Doctor found, from his own observations, that "the mean temperature of a room having no fire, in the town of Villa Franca, during the winter months was 60° Fahrenheit, with a mean range of 3° Fahrenheit. The out-door temperature during the day and for the same period was a mean of 60° Fahrenheit, with a range of 7° Fahrenheit. Comparing the climate of Villa Franca during the winter months with that of the south of England in the summer months, it appears that the average mean temperature of the Land's End in the month of August, during a period of twelve years, was precisely the same as that of the town of Villa Franca, in St. Michael's, during the months of December, January, February, March, and April. Again, the mean temperature of the winter months in St. Michael's is—

2° colder than Madeira.
5° warmer than Lisbon.
13° „ „ Nice.
12° „ „ Rome and Naples.

The highest known extreme of July near the level of the sea at St. Michael's is 86° Fahrenheit."

The island is about fifty miles in length, varying from five to twelve miles in breadth; consequently is about twenty miles longer than Madeira, and about the same width. Besides Ponta Delgada, containing from 15,000 to 20,000 inhabitants, there are several other towns of considerable size; the population of the whole island is estimated at about 100,000 souls.

Mr. Consul Hunt, in his very interesting description of St. Michael's, states that in 1840 the island contained 81,000 inhabitants. There are two convenient wide open bays, viz., Ponta Delgada on the south, with a small harbour and a secure open roadstead (except during southerly gales), considered the best in the island. The northern bay is called Ribeira Grande. The exports to England are various, amongst which there is an annual export of about 130,000 boxes of the celebrated St. Michael's oranges, besides 2,000 pipes of wine and brandy. The annual net revenue paid to the crown of Portugal amounts to upwards of 28,000*l*.

We must now proceed to St. Mary's Island, situated about fifty-five miles to the south. It is about seven miles long, by five in width, containing an area of about 36 square miles, or about 27,000 English acres. It possesses no good harbours, but produces abundance of wheat and other cereals. The soil is chiefly clay, and there are several potteries. The population is about 6,000.

Terceira.—This island is about 140 miles from St. Mary's, but smaller than St. Michael's. Owing to its central position it is the seat of Government. The port of Angra is superior to any in St. Michael's. Its chief produce is grain and cattle, but the wines are inferior, and the fruits are raised merely for home consumption. The population from 50,000 to 60,000.

Graciosa.—This island is chiefly noted for the extreme beauty of its aspect and scenery. Population about 15,000.

St. George.—There is nothing remarkable about this island, except that its supply of fresh water is very limited. Population about 5,000.

Pico.—This island is composed of an immense conical mountain, rising to the height of 7,000 feet direct out of the sea. The soil is in the highest state of cultivation, covered with vine and orange plantations. It exports annually 5,000 pipes of an inferior Madeira. Population about 26,000.

Fayal, within a very short distance of Pico, is the most frequented of the group, as it lies directly in the general track of vessels which cross the Atlantic. Its principal town is Villa de Horta. All sorts of provisions may be obtained there, especially bullocks, hogs, and sheep, but fresh water is not abundant. The bay is two miles in length by three-quarters in width, and depth of water from six to twenty fathoms. At about one and a quarter mile off shore the depth is from thirty-five to forty fathoms, with a sandy bottom. The anchorage is good off Horta, except when the frequent southerly gales blow. Population about 24,000.

Proceeding westward we reach Corvo and Flores (distance about 120 miles). These two islands are the most westerly of the group, and lie rather out of the usual track of navigators.

Corvo is the most northern island. It is well supplied with fresh water, but is deficient in harbours; nevertheless, I find there is a short stony beach (viz. of about 200 yards in length) on the eastern side, on which a few fishermen haul up their boats. The south end of this island bears the name of Ponta de Pesqueiro Alto. The best anchorages are on the western coast, at about one mile off shore, in thirty to thirty-five fathoms; and on the eastern side in twenty-five to thirty fathoms, situated about half-a-mile due east of Ponta de Casa: bottom sandy.

Flores.—This island is a little to the south-westward of Corvo, and is about nine miles long by five in breadth. Its numerous bays afford good shelter, and between Rocha Alta and Point Ilheos, the south-west extremity of the island, there is good anchoring ground at a short distance from the shore in twenty-five fathoms, with a sandy bottom. Provisions, such as cattle (which are small), sheep, pigs, vegetables of all kinds, eggs, and poultry, are very cheap. The latter are said to be very numerous, and the finest in the world. Although the inhabitants are both clean and healthy, they freely exchange their provisions for old clothes. Flores is well supplied with most excellent fresh water, constantly running. Population about 16,000.

Having deposited here (in anticipation) the shore end of my proposed submarine cable, I must now connect it with the shores of Newfoundland: the distance is generally computed to be from 1,000 to 1,050 miles.

I must admit that this is the longest and most difficult portion of my proposed new electrical chain, or new route of international communication between the Old and New World.

The length is considerable, and the dangers that may arise from the effects of crossing the great Gulf Stream during the paying out of the cable, together with the precise nature of the ocean's bed in that part of the Atlantic, on which a submarine cable must rest, are subjects for future examination and further exploration.

Referring to the great scarcity of water both in Fayal, Pico, and St. George's Islands, I think it may be interesting to mention that even in the year 1589, "when Edward Wright visited Fayal with the Earl of Cumberland, he remarked that there was then a great deficiency."

I believe that this want can be effectually, speedily, and cheaply supplied if boring is resorted to. As an instance that an efficient supply of fresh water can be obtained in boring through strata consisting of volcanic matter (of which these islands are formed), I beg to state that in the year 1829 a spring was tapped in the island of St. Helena, by merely boring to the depth of twenty-five feet through a similar volcanic bed, and that this single spring continues to yield on an average five tuns of water daily.*

Submarine telegraphy has opened out a new field of discovery for our naval commanders; it is therefore to be hoped that this new study will meet with the active and cordial co-operation of the Board of Admiralty, and thereby instil into the minds and resolutions of the host of officers under their orders, fresh enterprising activity.

OCEAN CURRENTS.

In the first section of my present paper, which I had the honour of communicating to this Institution on the 6th of May last, I was unavoidably prevented from referring to the several ocean currents which exist within these northern seas. I gather from Captain E. Irminger's (Danish Navy) interesting description of the great Arctic Current—a paper read at the Royal Geographical Society, 28th April, 1856—which annually brings considerable quantities of ice from the ocean round Spitzbergen to the south and south-west, passing down the eastern coast of Greenland, round Cape Farewell, and into Davis's Strait, and then up the western coast of that arctic continent northward until about latitude 64°, and at times up to Halsteinborg, 67° north, and even farther north into Baffin's Bay—that its true course and average speed has been fully ascertained.

With a view of facilitating the operations of that enterprising projector of the North Atlantic telegraphic scheme—viz., Col. Shaffner, United States—and others therein interested, I find in "The Accounts of the Whalers," by Larens Hansen, director of the school at Ribé, in Denmark, that in the month of June, 1777, ten whalers were enclosed by the ice between Spitzbergen and Jan Mayen Island, about 76° north latitude, and

* See Journal of Royal Geographical Society, vol. v. part ii. 1835.

were carried, constantly enclosed by the ice, in a south-westerly direction, between Iceland and Greenland, frequently within sight of the Greenland coast. All the vessels were gradually crushed by the ice, and the last on the 11th October, when in 61° latitude north, and in sight of the Greenland coast. Thus, out of 450 men, only 116 were fortunate enough to save their lives, having gained the coast during that month and the following. This proves that it required about four months for the ice to traverse a distance of about 1,400 nautical miles, giving the mean rapidity of this current of at least eleven to twelve nautical miles per twenty-four hours.

With respect to the temperature of the sea between Cape Farewell (latitude 59° 49′ north, and longitude 43° 34′ west of Greenwich) and 65½° latitude north, Capt. Graah states "that during the two summers and one winter he sojourned on the eastern coast he never found the temperature to exceed 34°, nor lower than 28° Fahrenheit."

It is rather a curious fact that this great arctic current should so hug the land of both the east and west coasts of Greenland, and not direct its course into the Atlantic Ocean. We can only suppose that an opposing current is the cause. I gather from Capt. Irminger's paper that the tail-end of the great Spitzbergen current unites with another current emerging from Baffin's Bay, which latter takes a southerly course down the western side of Davis's Strait, joining the Hudson's Bay stream, and, continuing along the coast of Labrador, strikes out into the Atlantic Ocean, round the northern shores of Newfoundland, conveying there those numerous icebergs which frequently disturb and endanger the navigation between Europe and Northern America.

In corroboration of the existence of a polar current in those waters, I find that Dr. Scoresby, in 1853, found, on crossing the Atlantic, "that there was a decided polar current, commencing at the meridian of 42° and finishing at 52° north, and that its greatest prevalence is found between those degrees."

These interesting facts annul the preconceived opinions of Sir Edward Parry and Captain Graah, who considered that it was the great Gulf Stream which was the physical cause of the great Spitzbergen arctic current taking the course it runs.

The stream, which is found to impinge on the western and southern shores of Iceland, also reaching the western coasts of Ireland and even those of Scotland, is found to be the *Baffin and combined Hudson's Bay Arctic current*. The temperature of this stream in latitude 57° 51′ north, longitude 41° 5′ west, was, on 13th June, 1819, at its surface 40½° Fahrenheit, and at 235 fathoms 39° Fahrenheit, a difference of only one and a half degrees. This is according to Sir Edward Parry's observations.

Captain Graah found it to be, on 5th May, 1828, and in latitude 57° 35′ north, and 36° 36′ west longitude, on the surface 46° 2′ Fahrenheit, and at a depth of 660 feet, 40° 5′ Fahrenheit; a variation of nearly two degrees.

Having traced out the course of those arctic currents, within the limits of Colonel Shaffner's proposed submarine route, I will now briefly refer to the *Great Gulf Stream*, which is within the regions of my proposed scheme.

The very peculiar nature of the Gulf Stream, together with its supposed

origin, has met the attentive study of Mr. C. W. Denison, who has recently submitted the result of his eight years' investigation for the consideration of the Polytechnic Association of the American Institute. I can only refer you to his very interesting Report, which is to be found in the "Mechanics' Magazine" of 29th March, 1861, and which is worthy of your perusal.

Commencing with the Gulf Stream in the Gulf of Mexico, I find that Mr. Thomas Hopkins records in his paper on "The Causes of Mild Winter Temperature in the British Isles," * that the temperature of that stream is from 86° to 100° Fahrenheit, this is, perhaps, the highest reached by any large body of oceanic water. The course of this current passes northward; and between Florida and the Bahama Islands it runs at the rate of five miles an hour, and is said to be fifty-two miles in width opposite Cape Biscayo. At latitude 28½° north it is about fifty-nine miles, and spreading as it proceeds towards Charleston, latitude 33° north, it is there found to be from 138 to 173 miles in width, running at the rate of five miles an hour in its narrowest parts. In the meridian of Halifax it is nearly 276 miles broad. On arriving in the neighbourhood of the great bank of Newfoundland it comes in contact with the Baffin's Bay arctic current, causing by the sudden evaporation those dense and dangerous fogs which are so prevalent off that bank.

The arctic current compels this warm stream to take an easterly course, and from the meridian of the isles of Corvo and Flores, we find, according to Humboldt, Mr. Consul Hunt, Dr. Bullar, and others, that "it continues to flow to the east and south-east, directing itself towards the straits of Gibraltar, the island of Madeira, and the coast of Africa, and then mixes with the equinoctial current."

The channels among the Azorean Islands are consequently clear and deep. These islands are also, at times, subject to severe gales of wind, and their direction generally coincides with the east and south-eastern course of the great Gulf Stream.

I believe that the currential directions of the great arterial flow of the oceanic body, have as yet not entered the important category of submarine telegraphic projectors.

The thorough knowledge of the temperature, strength, direction, and especially the nature of the stratum of these powerful currents, must be fully known, ere Oceanic Submarine Telegraphy can attain, or even approach, that permanency of existence as established in our admirable railway system.

I will but very briefly refer to the marine vegetable and animal species existing in the arctic seas, especially in the latitude of Cape Farewell.

It appears that the bottom of the sea in those climates is much more fruitful and better suited to vegetation than the surface of the land, presenting a great variety of fuci, ulvæ, and confervæ. With respect to the carnivorous animals, I must call your attention to the genus "Cancer." It presents itself under the various species of the crab, and, above all, of the shrimp, which latter abound in vast multitudes. To test their voracious appetites, the celebrated Captain Parry, during one of his voyages, had

* See Journal Royal Geographical Society, vol. xxvii.

some joints of meat hung out from the sides of his ship, which in a few nights were clean picked to the bone; in fact, nothing should be placed within the reach of these marine scavengers, except bodies the skeletons of which it may be desirable to obtain.

It is, I think, exceedingly expedient, before laying down any submarine cables in those icy latitudes, to test the various ravenous tastes of those marine animals, by indulging them with short lengths of gutta-percha and india-rubber coated wires, thereby affording practical demonstration whether or not such plastic materials are proof against the gnawing and destructive propensities of this innumerable Cancer tribe.

GUTTA-PERCHA AND INDIA-RUBBER.—The Gutta-percha gum is obtained from the Gutta-percha or Gutta-tuban tree. It is a native of the island of Singapore, and is extensively found all up the Malayan peninsula as far as Penang; it also grows in Borneo, and most of the adjacent islands. It belongs to the natural family "Papoteæ," but differs materially from all such described genera. The tree grows to a large size, averaging from sixty to seventy feet in height, and from two to three feet in diameter.

The first notice taken of this gum appears to have been by Dr. William Montgomerie, as contained in a letter he addressed to the Bengal Medical Board early in 1843, wherein he "recommends the substance as likely to prove useful for various surgical purposes, and supposed it to belong to the fig tribe." In the month of April of that year, a sample of this gum was brought to England by Dr. d'Aldmeida, who presented it to the Royal Society of Arts of London. The Society simply acknowledged the receipt of the gift, whereas they shortly after awarded a gold medal to Dr. Montgomerie.

We are indebted to the natives, or Malays, of Singapore and Malacca, for the discovery of this gum, who manufactured it into whips, jugs, basins, &c.; and who brought them into the towns for sale, and thereby this valuable material became known to Europeans. In the district of Penang, the senior surgeon, Dr. Thomas Oxley, A.B., says that he found the tree very abundant, although the inhabitants of most of those parts had no knowledge of it, nor of the gum it contained. I will not enter into the lamentable details of the methods used by the Malayan and Chinese collectors of the gum, but simply state, that these lofty, slow-growing trees, are cut down, and the sap or gum is extracted. The quantity exported from Singapore to Great Britain and the continent of Europe, from 1st January, 1845, to about September, 1848, amounted to 6,918 piculs.* It is averaged that ten trees will produce about one picul, so that 69,180 trees must have been sacrificed. This wholesale destruction could be obviated, provided the gum was merely extracted or drawn from the tree by tapping, which method is adopted by the Burmese in obtaining the caoutchouc from the *ficus elastica*. The pure gutta percha is of a greyish white, but the gum usually brought into the market is of a reddish hue, arising from chips of bark which fall into the sap during its exudation from the tree. Besides these, there is a large quantity of intentional adulteration by sawdust and other materials, but it can easily be

* A picul of 100 tatties equal to 133⅓ lbs. (avoirdupois); 6,918 piculs are equal to 8,246 cwts. or $412\frac{3}{10}$ tons. See McCulloch's "Commercial Dictionary."—G. R.

cleaned by boiling it in water until well softened, and then extracting the impurities; it is after being rolled out into thin sheets fit for surgical appliances; the foreign matter is merely entangled, or otherwise mixed up, but is not incorporated in its substance.

I can fully bear testimony to the fact, as, during some prolonged experiments I made about twelve months since with the various existing gums, I found that the thin translucent sheet of gutta percha was full of very minute impurities, such being particles of very fine bark, or cork dust. This can be very easily verified by a microscopic examination of the two substances.

India-Rubber.—The nature and properties of this gum are so universally known to the civilized world, that I fear any detailed information respecting their peculiar qualities would be considered too much of a repetition to merit your kind attention. The very important and interesting subject of the construction of submarine telegraph cables, which (especially during the last ten years) has been so fully ventilated by the various and extensive experiments of our ablest electricians, now has found a lasting and, I trust, an imperishable record in the Government Official Report, recently presented to both Houses of Parliament by command of Her Majesty.

The Blue Book (as you will perceive) is exceedingly bulky, and containing as it does, such a vast amount of valuable information, I hope you will kindly permit me to merely refer you to the official printed Report.

Having now humbly but earnestly endeavoured to disseminate further detailed information respecting this all-important electric branch of our grand scheme of universal progressive civilization, I cannot conclude my remarks without re-echoing the pathetic words of Desmond Ryan, Esq., and must call

Ye powers of every nation,
Heaven's sacred light receive!
One grand confederation
Of brotherhood achieve.

Would that—

Now Freedom o'er the world her banner waving,
In concord bids all nations to combine,
Dispels the dark'ning fears mankind enslaving,
And links all hearts in harmony divine!

Then *Art shall reign*,—war, strife, ambition ended,
And, wing'd by knowledge, man shall claim the skies;
Love, peace, and harmony, eternal blended,
Shall make of Earth a glorious paradise!

Sing! let's sing and waft the blessing
Below—around—above,
With heart and voice expressing
Peace—Unity—and Love!

The Chairman returned thanks to Major Rhodes for his interesting communication, and observed that the subject was one of the highest importance at the present moment, considering the state of affairs on the American continent. He hoped that ere long we should have telegraphic communication with America.

Colonel Shaffner said, that, at the last discussion upon this subject, he spoke with regard to Iceland and Greenland. He had not much to say in addition, except

what might pertain to the question of Ocean currents. He could not agree altogether with Major Rhodes upon that point, especially with reference to the Gulf Stream. If he understood Major Rhodes to say that the Hudson's Bay and the Davis Strait currents swept over to the Faröes and to North Scotland, he could not agree with him as to the correctness of that opinion. It was the Gulf Stream, he thought, that swept not only the Faröe Islands and to the north of Scotland, but also the south of Iceland. In proof of this, he might state that he had found upon the south shores of Iceland what in America was called the "buck-eye" seed. He had found the same seed upon the shores of Greenland. The Gulf Stream, as Major Rhodes correctly said, runs north with the coast of America and south of Newfoundland, and then he did not know where the Major carried it; but according to his reading and observation it ran across and eastward from Newfoundland, and swept not only the north of Scotland, the Faröes, and South Iceland, but it went on to the North Cape, at the northern part of Norway. Where it went to then he did not know, nor had he seen a sufficient explanation of it. Neither Maury nor Irminger gave information sufficient for him to form an opinion. But, as he had said, he had found buck-eye seed on the south shore of Iceland, also pine timber. The pine timber might have come from the north of Europe, but the buck-eye came from the Mississippi valley, and he believed it was carried there by the Gulf Stream and left on the coast. On the east coast of Greenland he had found many sticks of pine, and he had found the same kind of timber floating on the west coast of Greenland. That would seem to establish the fact that the Spitzbergen or arctic current swept round Cape Farewell, and then went northward to Baffin's Bay, and not across to Newfoundland from South Greenland, as some had supposed. In 1859 he coasted along the shores of Greenland, and got up to about Cape Vallöe, when the wind took him out to sea. He observed that it blew the ice from the coast, and it was swept by the current round the southern point of Greenland, moving at the rate of about eighteen miles a-day, as near as he could calculate. Like results were seen by him on the "Fox" voyage in 1860. The vessel went to it in the daytime; and he observed that the ice was moving on; at night she had to lie in a clear sea. The "Fox" proceeded westward of Cape Farewell, and he found the floe ice was getting a-head of the vessel. A hurricane took her north of the ice floe, and she then came back in the open sea, and landed at Frederichshaab. There was no ice there; but while at Frederichshaab, taking observations upon the mountains, he saw the stream of ice coming north, and it continued passing four or five days. He saw it arrive, pass, and depart, so that he knew from his own observation there was a considerable stream there from forty to sixty miles wide. It did not coast exactly, but went about fifteen or twenty miles from the shore. Some had a theory that the Gulf Stream current passed Cape North, then rounded to Spitzbergen, and so came back to the coast of Greenland; if so, that might account for the buck-eye being found where it was, in south-west Greenland, and by following the course of the current it would be carried into Baffin's Bay; at all events, the floe ice from Spitzbergen and the east coast of Greenland came round Cape Farewell, and ran north with the west coast about fifteen or twenty miles from the shore. He had made observations off Nanarsoit, and it was there he picked up several pieces of timber in blue water. The ice in North Davis's Strait turns and nears the American coast. When he was upon the Labrador coast, at Hamilton Inlet, he noticed that the thread of the current was about seventy-five miles from the shore. Many bergs were near the shore, grounded on the rocks. The largest iceberg he ever saw was in the Strait of Belle-Isle; he found that the bergs did not descend so deep as many persons supposed. That was all he could say with regard to Ocean currents, and it was wholly in accordance with the reasonings of Maury, Irminger, and with his own observations during his voyages to Greenland, Iceland, Labrador, and the Faröe Islands. With reference to the southern route, which Major Rhodes had very graphically explained, he should be happy to see it consummated. There would be business enough not only for one telegraph, but for every line that could be laid across the ocean. No one would have more pleasure in seeing that project perfected than himself. It was possible, however, that the exact route which Major Rhodes had marked down would not be carried out on account of there being so many landings for the cables—numbering some eighteen, which might be an objection. Now, if a line were run to Portugal, and thence to the Flores, those sections could be worked to the same advantage, if not to a greater degree of transmission, than the section from the Flores to Newfoundland. The distance from the Flores to Newfoundland was from 1000 to 1100

miles, which would give a cable of 1600 miles, and, according to his notion of telegraphy, that could not be commercially worked. Still it was possible the ingenuity of electricians might be able to overcome the difficulties which presented themselves to the practical use of the telegraph over great distances like this. He looked at a telegraph in a commercial light only. The line from Portugal to the Azores, he thought, was practicable, and could be worked twice as rapidly as a line from Flores to Newfoundland. If the line were constructed and operated it would be useful to the whole world. There would be business enough for all; and to anybody who undertook the enterprise he wished God speed!

Mr. ROWLANDS OWEN said he had been very much pleased with the route that Major Rhodes had pointed out. It seemed to him a practical one, and to embrace very important matters, socially, commercially, and politically, by uniting England to Portugal (with which country we had large transactions); then to Gibraltar, to Madeira, and to the Azores, there would be at least three distinct lines, that would be very advantageous. With reference to the comparative merits of gutta percha and india-rubber as insulating mediums, he had for the last two years been examining into the character of various insulating materials, especially of gutta percha and india-rubber. It would take too much time to enter into details, but the result of the examination was that india-rubber was especially an excellent insulating medium, and he looked for our future success in Ocean telegraphy to the adoption of that material. The temperature of the Gulf Stream was so high that india-rubber was the only material he believed that would be found capable of enduring it. He had examined numerous pieces of gutta percha which had been in the water for years; he must say he had found it in every instance improved as an insulating medium. On the other hand, he had examined india-rubber which had been in the water two years, and he had no hesitation in saying that as an *insulating* medium it was superior the day when examined to what it was when first laid down, so greatly had its quality improved. We were certainly in possession of the materials necessary to carry on any line, and it now only remained to revive public confidence in the practicability of Submarine Telegraphy, which confidence had been so much depressed in consequence of recent failures; these need not now occur, as electricity was a simple science, which any man who gave his attention to it might easily understand. Unfortunately for some years the subject had been very much mystified to the public, and he attributed the serious losses which had occurred in telegraphy to the fact that the workmen employed about the manufacture of the cables had not sufficient knowledge of the subject. It was a simple thing to lay a cable in the sea. An intelligent captain and competent sailors were required, and with these, now that we had got the materials perfected, he looked for complete success.

The CHAIRMAN observed the subject was of so much importance that they must all hope that Major Rhodes' proposed route might be eventually carried out.

Major RHODES said he wished to make a few remarks upon the subject of Ocean Currents, to which Colonel Shaffner had addressed himself. The information he had given with reference to the Gulf Stream, starting from Bermuda up to the great Bank of Newfoundland, was not derived from his own personal knowledge, but from various reports given by scientific men, who had recorded the results of their own experiments. It was Dr. Scoresby who (on crossing the Atlantic Ocean between latitudes 42° and 52°) found there was a current running down from the north which cut off the Gulf Stream. The coldness of the water (for there was a fall in the temperature from 80° to 60°) was sufficient evidence to prove that it was a cold stream that came down from the north. With reference to the Gulf Stream, he must again remark, that not only the great Humboldt, but also Mr. Consul Hunt, who resided for many years in the island of St. Michael's, and also Dr. Bullar, all stated that the Gulf Stream, upon arriving at the great Newfoundland Bank, was turned to the south-east, and continued its course among the Azores and to Madeira. They distinctly stated from their own experience that *that* was the course the Gulf Stream took. The cold stream which came from the north, as fully proved by the temperature which the thermometer indicated through a space of 600 miles, was of such magnitude as to be able to cut off the Gulf Stream.

The CHAIRMAN thought there was no doubt that the Gulf Stream did extend over towards England.

Major RHODES said, in the remarks of Mr. Thomas Hopkins on "The Causes of the Mild Winters in the British Islands," he referred to the generally received opinion, that it

was attributable to the great Gulf Stream coming northward and impinging upon the shores of Ireland and Scotland; but he treated it as an erroneous opinion, for the real cause of the mild temperature on our coasts was due to hurricanes that came from the south and west, collecting in their course the vapours that arose from the Gulf Stream, and consequently hurling them northward. It was the excessive dampness of the atmosphere, caused by the vapours brought by these hurricanes, that in his (Mr. Hopkins') opinion accounted for the mildness of the winter on the shores of Ireland and Scotland. *For the formation of ice a clear and dry atmosphere is necessary.*

Colonel SHAFFNER said he had omitted to mention one thing, which was, that it was so warm on the southern part of Iceland that no ice was formed there. Again, at the Faröe Islands, the climate was so moderate that very little snow fell, while on the northern part of Iceland there was a great quantity of ice. That part of the island was under the influence of the Spitzbergen Current, while the south part was supposed to be under the influence of the Gulf Stream; at the Faröe Islands, which were also supposed to be under the influence of the Gulf Stream, there was not ice enough formed for a man to skate upon.

Captain INGRAM, R.N. reminded the meeting that Lord Dufferin, in his "Yacht Voyage," stated that he was able to land on the south-west coast of Spitzbergen, owing to the influence of the Gulf Stream, which he mentioned particularly as going as far north as that. It would be also remembered that there was a harbour on the north-west coast of Norway, which the late Emperor Nicholas was so anxious to possess, and that never froze owing to the action of the Gulf Stream. He had always understsod that our mild climate was due to that Stream.

The CHAIRMAN said, perhaps Major Rhodes would take into consideration the suggestion of Colonel Shaffner about taking the line across from Portugal to the Azores direct. To carry it out as proposed by Major Rhodes would cause a great many breaks, and necessitate having an establishment at each place. It occurred to him that that would be a bar to the successful working of his scheme.

Major RHODES said, so far as he recollected, a line from Lisbon to the Azores (about 780 miles in length) had already been proposed to the Portuguese government three or four years ago, but the proposal appeared to have died a natural death. His object in proposing to carry a cable to Madeira was, in the first place, to gain an electrical communication with Gibraltar, without interfering with the continental routes in any way, and therefore to have an independent line of communication. He was looking at the subject in a strategical as well as a commercial point of view. Then with regard to Madeira, we knew that invalids resorted to that island, and also a great many ships homeward bound from the East Indies called there; it would therefore be very valuable in many cases to have telegraphic communication with Madeira. Certainly the line from Lisbon to the Azores would be more direct and simple if the only object were to connect Europe with America; but he (Major Rhodes) thought it would be rather impolitic to avoid Madeira, which was such an important island to our East Indiamen coming home; besides, it would serve as a stepping-stone towards telegraphic communication between England and the Cape, and be part of a system which might eventually be carried out to connect the whole of our Colonies with the Mother Country. These were some of the reasons why he proposed this route, which he did not for *one line* only, but for a variety of purposes.

Evening Meeting.

Monday, March 5th, 1860.

Col. the Hon. J. Lindsay in the Chair.

The Chairman said that he had the pleasure to introduce Mr. Julius Jeffreys, formerly Staff Surgeon of Cawnpore and Civil Surgeon of Futtegurh, who had been kind enough to come there for the purpose of giving an account of his proposed improvements in the clothing, tent, and housing of British troops in the tropics. It was a subject, with many others of a sanitary character, which in the present age, in connection with the position of the British soldier, was gradually increasing in importance. Means such as Mr. Jeffreys brought forward, such as Mr. Sidney Herbert brought forward a short time ago, in the shape of sanitary improvements in the army, were gradually raising the comfort of the British soldier, improving his health during peace, and making war as easy to him as possible under the novel circumstances in which he then became placed. There was no doubt that the subject which Mr. Jeffreys was about to bring before them, The Clothing and Housing of Troops, especially in the Tropics, where special clothing and special housing were required, was calculated to be of great service to the army.

Mr. Jeffreys then read his paper, as follows:—

ON IMPROVEMENTS IN HELMETS AND OTHER HEAD-DRESS FOR BRITISH TROOPS IN THE TROPICS, MORE ESPECIALLY IN INDIA.*

By Julius Jeffreys, F.R.S. formerly of the Indian Medical Staff.

Although occupied during the leisure hours of the greater part of my residence in India in experimental and statistical inquiries into the climate, arts, and resources of that country (for which objects I carried out with me, on entering the Indian service, a variety of philosophical apparatus), I have, since my return to England many years ago, maintained, till of late, so general a silence upon Indian subjects, that I cannot but feel how great must be the disadvantage under which I present myself before you.

In undertaking an address upon the Clothing, Tents, and Housing of British Soldiers in the Tropics, more especially in India, I need hardly observe, that the field to which my remarks will be chiefly confined is the sanitary section of each of these subjects, and to certain points only in that section. Before this section can be placed in such a position of efficiency

* The publication of this paper has been delayed, in order that a second paper by Mr. Jeffreys, On Tents and Barracks for English Troops in the Tropics, might be published with it; the manuscript, however, has not yet been sent in.—Ed.

as every person of right feeling and judgment must desire, the provisions required are so numerous, and have to seek their principles in so many departments of knowledge, that these, the sanitary branches, would alone occupy many minds and many days in a full discussion of them.

The military branch of these subjects it falls, of course, to members of the profession of arms to discuss. But there can be no real military efficiency in these departments without a corresponding sanitary efficiency. How vast the importance of the latter is we have been taught, not so much by its presence, alas! as by its too frequent absence hitherto in the British and Indo-British armies. In the field more especially before us—India—we have been taught what the comparative importance of the sanitary question is, in the fact that, with contingencies far more favourable than we had a right to calculate upon during the perils of the last two years, the assaults of the enemy have, in their effects, scarcely exceeded a tithe of those produced by climate; which has been also the chief destroyer even of the wounded. And in many a march where not one man has been wounded, numbers have fallen under sun-stroke. In what was called the defeat of a body of Her Majesty's 35th, at Arrah, the following authentic list of the casualties will show, that it was no defeat by man, but by the sun—a panic, not from the startling surprise itself, but from the action of the sun upon men's brains—upon those who died and those who survived:

Detachment of Her Majesty's 35th.—Officers.—Killed, 1; died from apoplexy, 2. Men.—Killed, 8; wounded (but died from apoplexy), 10; died from apoplexy, 84; total, 102 men and 3 officers.

Naval Brigade.—Killed, 5; wounded (8 died from apoplexy) 9; died from apoplexy, 5; total, 19.

Artillery.—Killed, 3; died of apoplexy, 1; total, 4.

Rattary's Sikhs.—Killed, 7; wounded, 7; officers wounded (Captain Waller), 1; total, 15.

Grand total, killed, wounded, and missing, 143.

Here were, in the 35th Regiment, 96 deaths by the sun, 10 of which were cases of wounds rendered fatal by solar apoplexy; and only 9 killed in conflict. What then must have been the cerebral condition of the survivors, and what havoc in their other vitals has not since resulted!

Of the troops which under Sir Henry Havelock so nobly turned the tide of rebel progress, the great majority have perished by the climate; and mainly through the sun's direct and indirect action.

I have seen letters stating that soldiers, though wearied by exertion and exhausted by heat, have oftentimes not dared to lie down at night to rest, lest the sun's influence, which had been withstood while they were in an erect position, should only have been postponed until the horizontal position and diminished vitality of sleep, by favouring the induction of apoplexy (sanguineous in some, and nervous in others), should cause them to be overtaken by death while they were seeking refreshment in sleep. Such a spectacle as that of wearied comrades snoring into death might well appal the stoutest hearts!

But this direct sun-stroke by day and deferred sun-stroke at night, though the most appalling, are not the most extensive effects of the sun. There are thousands who escape it, but whose constitutions become quickly ruined by the sun; who are by it disabled to survive any but slight wounds

and operations, and who are by it rendered, long afterwards, obnoxious to the action of every form of malaria prevalent, chiefly through the exhaustion of the skin; for, as I have elsewhere taken occasion to remark, it may be received as a pathological maxim—that the skin's debility is malaria's opportunity.

It has also to be borne in mind, that it is not so much atmospheric heat, but mainly the solar ray, which has to be dreaded in the field. Gradually injurious as the former is, and not to be trifled with when avoidable, it can be borne by most persons of any vigour for a long time, without destructive consequences. The Parliamentary Reports on bleach-works in England show that even women and children endure for years the cruel heat of stoved rooms exceeding most atmospheric heat in India.

Deplorable as has been the decadence of hundreds of fine men in the prime of life, the casualties from climate would have been manifold greater, had not the Sikh and Punjabee, through the consummate ability of the rulers in the Punjaub, been brought into that position between the British soldier and the sun of India deserted by the Hindoo sepoy, and performed many a duty by day which would have been destructive to our countrymen, equipped as they were; and had not also the Commander-in-chief manifested his excellent judgment and feeling in forbidding to the utmost all avoidable exposure of them, even though the Sikhs should vaunt themselves upon their ancillary feats in the sun. The intervention of the auxiliary Sikh, and the judgment to employ him to the utmost in shielding the European, can be rightly viewed only as a Providential arrangement for preventing the consummation of the revolutionary work; for, otherwise, a mortality of British troops would have been witnessed which could scarcely fail to have invited a more general insurrection, and would certainly, had the conflict been prolonged, have soon exhausted the British forces in the country, and the military resources here for recruiting them.

Since calamities from solar influence have been witnessed on a grand scale, once at least in every decade of our hundred years of Indian experience, and in a great though minor degree in peace throughout the whole of that time, it might be supposed, and it has been by many, that this deplorable destruction of British life and health is an unavoidable contingency of our retention of a great tropical dependency. Some, on the other hand, contrasting the destructive effects of the sun upon troops thrown into India in their European clothing, with the greater protective power of an Asiatic costume, have placed too implicit a confidence in the turban, "sola" pith hat, and white tunic.

The fact, long established in physics, and very valuable under certain circumstances, that such white surfaces repel far more heat than do darker ones, has also tended to confirm this reliance in them, and especially in the "sola" hat, on account of its substance being also a slow conductor of heat.

Now these important properties will not alone avail. It is notorious that under a white cotton head-dress many men on the line of march have dropped down in apoplexy, and far more have had their constitutions ruined by the sun. I am informed that officers in Burmah were sun-struck while wearing the "sola topee."

I never met with the man who, though often with fancied, could with

real impunity expose himself day by day and throughout the day, relying on an ordinary sola-hat, unaided by at least an occasional use also of a chattah.

It could not be otherwise. The outer layer of tents, even when new and of dazzling whiteness, and though lofty, and having below it many plies of cotton cloth in the two "flies," cannot, unless under the further shelter of trees, save the inmates from needing often a wetted turban, or being driven under the table for further protection.

Moreover, not only do rain, dust, and the smoke of war soon destroy that purity of colour requisite to give much reflective value to whiteness, but, unlike a properly directed metallic face, white reflects solar as well as diffused light in nearly all directions, and must therefore, when spread over an army of men, become trying to the eyesight. But I do entirely believe, and the further my inquiries and experiments have carried me, the stronger grows the conviction, that there is not in the nature of the case anything to prevent our holding India securely without causing annually, as well as periodically, a moral depravation and bodily destruction of so many thousands of our fellow-countrymen in the ranks.

Our hundred years of apparent experience to the contrary can be allowed to weigh nothing, when it is borne in mind that the physiological and sanitary branches of military organization in India have never been authoritatively represented in the "Council Chamber;" whereas the fields of science these branches spread over, are so various, and the application of principles of the greatest importance, is often so difficult, that a due proportion of the authoritative body should manifestly be composed of minds severally devoted to the cultivation of the different fields of such science.

That proportion will not be a small one when, if ever, men in responsible power shall duly consider that there are few, if any, military questions with which these several branches of physical and sanitary science are not in some way concerned, and a vast number in which they are wholly or mainly concerned. It is of little use that such knowledge should be available when called for. It must exercise a prompt and authoritative influence in the decision of every question in which these branches of knowledge had a part. Of this we may rest assured, that on every occasion upon which such influence should be rightly exerted, the military object itself would be eventually promoted.

Even on such a question as the right suspending and poising of the traps a soldier has to carry, ought those who had studied his bony structure, and the position, direction, comparative strength, and uses of his muscles, to be carefully excluded from the decision?

What physiologist of any genius and independent thought, if placed in responsible authority, could have ever committed the error of distressing the soldier with a stiff neck-stock, disturbing the easy play and the tension-balance of the neck-muscles, and exercising a dangerous and stupifying compression of the jugular veins, or (by tight buttoning and girting) of squeezing out half the resident air of his lungs, and impeding the free action of the intercostal muscles and the diaphragm: as if the object were to enfeeble the whole system by restraining the purification and oxydation of the life-blood? What council which, comprised with physiologists, men also devoted severally to natural philosophy, to experi-

mental and to mechanical science, could have devised or consented to the adoption of such head-dresses as the "shako," the bearskin cap, and the foraging cap? Is it to be wondered at, that whenever an army takes the field under at all trying circumstances the same disasters recur again and again, when we find the office, not only of manufacturing, but of contriving also, to be commonly handed over to those whose respectability in their several trades, however high, offers no guarantee of a scientific qualification for the task, but is almost incompatible with it—while we find persons who have not devoted a single year, not, perhaps, a single month, to the cultivation of the many branches of natural and experimental science involved in the questions before us, undertaking tasks upon a right fulfilment of which, hang the lives of thousands?

Of this I am very certain, that the deeper the insight any man shall acquire into the principles involved, and the provisions requisite for giving to each principle a play proportional to its importance, the deeper will be his sense of responsibility in the undertaking, and the greater his desire that it should be shared by other minds; each taking in hand his especial part, and submitting his views to the collective judgment of the rest.

Thus, with respect to the plans I am about to submit to you, I should be sorry indeed to appear to arrogate for them perfection. It was not till the eleventh hour, when the mutiny had occurred, that, unable of course to foresee the heaven-sent Sikh standing between our countrymen and the sun, I ventured to express to those in authority the conviction, on the one hand, that without more suitable dress for the soldiery, little else than extermination awaited them, and, on the other, that such were the resources offered by natural science that sun-stroke ought never to befal men in fair health. Under this impulse I left at the India House, two years ago, certain helmets, hastily constructed, of those redoubtable proportions which had afforded me effective protection during seven years of trying exposure—and to which I naturally clung, though they were doubtless too cumbrous for military use. By a mistake those helmets were sent out to India, with copies of my work on the British Army in India, which the late Court did me the honour themselves to forward, contrary to the understanding upon which the helmets were left at the India House.

While attempting, in a single discourse, to submit to your judgment certain results of my own experience and experiments, in proportion as I shall be compelled to hurry over the details, do I feel the necessity to be the greater that some remarks should be premised upon the leading principles they involve.

Time permits me to refer to little more than a few points relating to the sun's action both on the living man and on inanimate matter, available for his protection from its rays.

With respect to the action of the sun upon the living body, I have already offered a few remarks. In a work published the year before last, of which a copy was I believe sent to most persons in authority, it was my endeavour to throw some fresh light upon the subject, and at the same time to treat it in a popular and, as I hoped, an impressive manner. I would here only invite attention briefly to the consideration that, while the brain is the part most sensitive to the influence of the sun, it is not only that organ which, with the spine, gives action to all the vital and animal

functions, but it is the seat of the mind also. It is the seat of a man's courage or nervous timidity, of the elevation or depression of his spirits, of his contentment or disaffection. When we see in a marching column this great organ, so incomprehensible in the variety of its marvellous functions, sun-struck in every degree, from a slight headache up to snorting apoplexy, and when we do actually witness the induction of mania in certain instances, and when we further consider how infectious are mental impressions, under any common influence, we must, I think, regard it as surprising, and nothing less than beneficently providential, that whole bodies of men have not as yet been seized with frenzy; or that their mental functions have not been at least so far disturbed, that panic, or the inveterate desire to return to one's native country termed *nostalgia*, or a sullen disaffection, have not, one or all of them, been induced.

Let it not be idly assumed, because such results of climatic influence may not as yet have become epidemic, that they never can. If report be correct, after a certain detachment had lost, it is said, three-fourths of its men in one day by the sun, something like panic was manifested in a body succeeding to the duty.

I proceed to say a few words on the reception given to the sun's rays by certain inanimate substances, especially by their surfaces.

The importance of this question will appear in all the stronger light when we bear in mind that, excepting when a man suffers from having exposed himself uncovered to the sun, we speak incorrectly in saying, "he is sun-struck." When he is wearing a hat, or is under a roof, as of an opaque * tent or house, he is hat-struck, tent-struck, or house-struck, but not sun-struck. The sun only strikes these intervening matters. Its rays are entirely arrested by them, and it is they which transmit them to their under surface, and then impart them to the head; by direct conduction where they touch it, by radiation to it where they do not, and also by heating the intervening air.

Many a man is struck dead by the radiating power of the interior surface of his hat.

Absolute contact, or near approximation of the sun-struck matter to the head or body, being the worst condition possible, it is desirable that around the sides, as well as the top of the head, in the case of the head-dress, and of the whole body, in the case of tents, as free a space should be given as is admissible, for air to blow copiously by, that it may both ventilate the living surfaces and (by convection) carry off into the atmosphere heat from the perniciously radiating surfaces around them. Whether it be a tent, or house, it must have free ways for air both to come in and pass out, but at the same time the current should be under thorough control. Thus much briefly for the universal importance of ventilation and convection.

With respect to the processes by which solar heat is received and set in motion by terrestrial matter, namely by radiation, reflection, conduction, and convection, there are peculiarities in their application to the cases before us, which require that we should seek instruction by experimental inquiry, differing in certain respects from any which have been recorded, so far as I am aware. Space compels me to presume that my hearers are

* Few tents are opaque; some admit so much sun-ray that a person in them, if struck, will be partly sun-struck and partly tent-struck.—J. J.

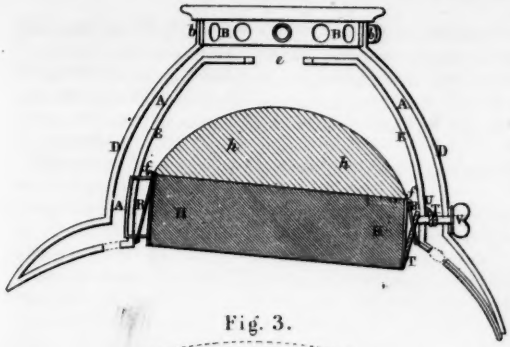
acquainted with the scientific truths already established on the subject, and to confine my remarks to a few results of my own inquiry.

I must presume that it will be in the recollection of my hearers, that nearly in proportion as the surfaces of opaque matter are dense, smooth, and bright, especially as they are metallic, will they prove both least willing to receive heat projected upon them from bodies not in contact with them, and least willing also to project. or radiate, heat from themselves, while they are most ready to receive and transmit heat from bodies in actual contact with them, *i. e.* by conduction; and by converse, in proportion as surfaces of matter are porous and rough, and also as they are of dark colour (especially fibrous and organised matter, such as cloth), do they both most willingly absorb heat radiated upon them, and most willingly also part with it by radiation, while they are slow to receive or transmit heat by conduction. Furthermore, that these opposite properties of matter in relation to radiation appear to lie in the very surface itself. The thinnest film of metal overlying any matter will greatly restrain the passage of heat by way of radiation.

The plans I have to put before you are based chiefly upon observations made in India, on the action of the sun, and upon experience in different means for warding it off; and partly upon more recent experiments with thermometers variously coated; and with others inclosed in hollow cylinders and prisms. The thermometers employed had most of them cylindrical bulbs. Desiring to obtain a mercurial thermometer of increased surface and sensitiveness, by greatly increasing the proportion of the surface to the mass of metal, so that it might be possible to observe momentarily the relative absorption of the solar heat by clouds of different density, in their transit, it occurred to me, if two hemispheres of slightly different radii were placed, the smaller within the larger, and could be sealed together round the edge, and have a tube connected to them communicating with the concave space between the spherical sections, that, if this space were filled with mercury, a thermometer of both great surface and of great sensitiveness would be obtained; that its two spherical surfaces, even the concave one, would, though it should be $1\frac{1}{2}$ inch across, be able to sustain the atmospheric pressure upon the vacuum within, which flat sides could not, for an instant; that the expansion and contraction of the one surface might so closely correspond with that of the other, that a uniform rate might be obtained which could be easily determined, and would not disturb the indications of the mercury, though each apparent expansion of it might be in a small degree lessened; and, lastly, that for certain observations a spacious concave surface would offer peculiar advantages.

On mentioning my wish to Mr. Zambra, of the house of Negretti and Zambra, he stated that in blowing thermometer bulbs he had occasionally, I believe by some accident, sucked one hemisphere of the bulb into the hollow of the other, and, though he had never turned it to account, he thought he could produce such an instrument as I was seeking. The one before us, fig. 1, is the result, and I think, for a first attempt, shows great skill in the maker. *A A* is a transverse mid-section of a hollow hemisphere of glass, with an ordinary stem *B B* rising up from its edge. The dotted curves *C C C* complete the form of the bulb, as seen on its concave side. Though the bore of the tube is too large, and it is other-

Fig. 2.



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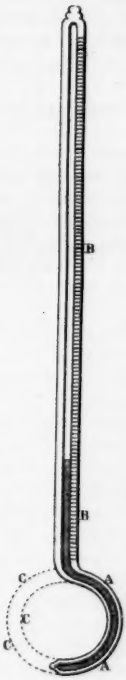


Fig. 3.

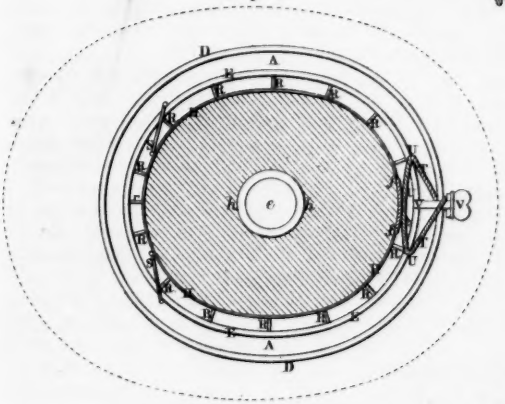
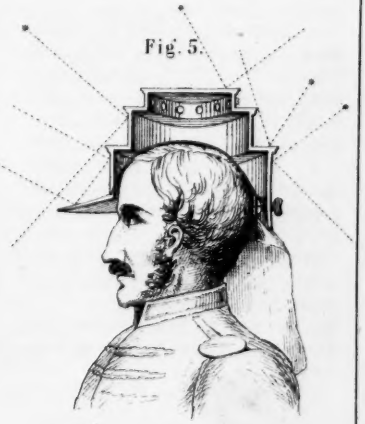
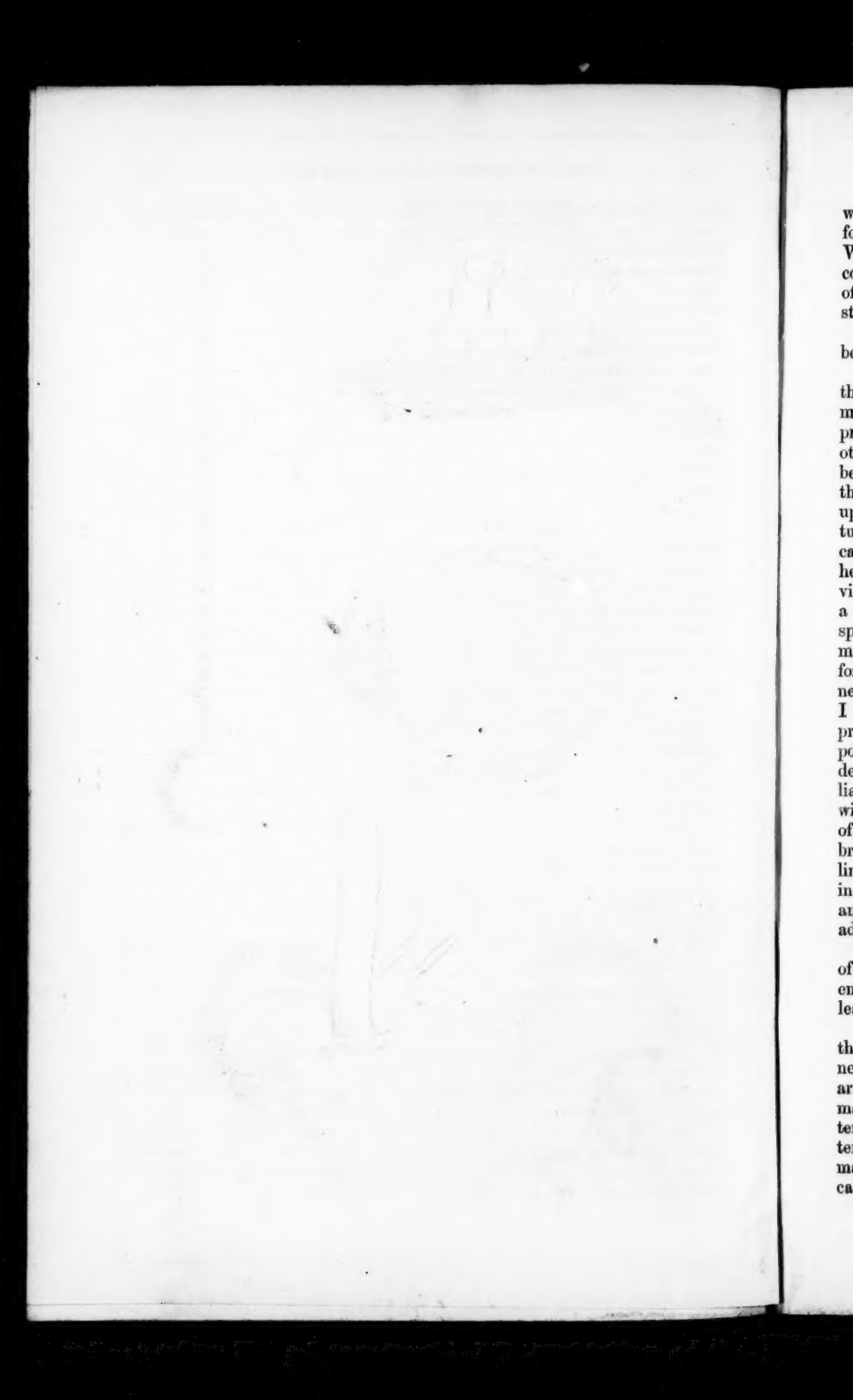


Fig. 4.

Fig. 5.



J. R. Jobbins.



wise not perfect, it promises well. Such a thermometer is well adapted for solar observations, whether the concave or convex surface be employed. When the latter is blackened, and presents its large surface to the sun, the concave back can be easily shielded from the action of wind and from loss of heat by its own radiation by a drum-head of gilt or aluminium paper stretched across it.

Next to a thermometer insulated in a vacuum, this, I think, promises to be the most suitable instrument.

My observations have generally been made with half a dozen or more thermometers at once, some with the bulb in contact with the covering medium, with the bulb insulated in single cylinders or quadrangular prisms of three different diameters; some in two cylinders, one within the other, and some in three concentric cylinders—the cylinders themselves being of various materials, and variously coated, and being sometimes thickly wrapped round with different substances. The current of the air up the cylinders was sometimes increased by elongating them with a glass tube acting as a chimney. At other times the current was shut off by card valves, the air stagnating within them as in a common "shako" or helmet, or in the pyramid of a tent. Desirous of trying the repellent virtues of the new metal—aluminium, and having heard that Mr. Marshall, a manufacturer of leaf metal of much ingenuity and spirit, had produced specimens of aluminium beaten into leaf, I applied to him, and found him much interested in my proposal that it should be introduced as a coating for the surfaces of hats. At no little trouble—the manufacture being new—he prepared for me some books of aluminium leaf. The present is, I believe, the first employment of this metal in the form of leaf, and it promises to be of much utility. I find it to possess great reflecting power, though the experiments have not been continued long enough to decide its virtues as compared with gold leaf. It has apparently little liability to become tarnished. The interior of this pattern helmet is lined with leaf aluminium. I find it to form an excellent article also in the form of aluminium paper. Both aluminium and tin, in the form of leaf or bronze, could, I am satisfied from trial, be united to a smooth calico or linen surface, by means of a flexible cement, prepared from gutta-percha, india-rubber, or other hydro-carbons. I find on trial both india-rubber and gutta-percha promise to answer the purpose, and to have the great advantage of giving much flexibility to a metallic cloth.

The chief obstacle to their employment might prove to be the fusibility of the cement, but this might probably be remedied, or some other cement employed less brittle than gold size. The common japan used for patent leather might answer the purpose of a cement for fixing the bronze.

I find, then, in the first place, that the power which a single surface of these metals (though a mere film in thickness, and of but moderate smoothness and brightness) possesses of reflecting luminous heat, will enable it to arrest the entrance of solar heat more than any quantity and bulk of fibrous matter like felt or cloth, which could be employed in a head-dress or in a tent, and which acts only on the principle of slow conduction, erroneously termed non-conduction. Of so little comparative avail are such fibrous matters in arresting the sun's impinging heat, that they can scarcely be called even slow conductors.

Experiments with thermometers, in which the screening substance is in contact with the thermometer, have, during the last century, been repeatedly made and published. With their general results, the trials I have made of that character have duly accorded; as likewise appear to have done the recent valuable observations by a French physician, Doctor Soulier, upon the different wove fabrics employed in soldiers' dress; but I have thought it also of much practical importance, as well as of scientific interest, to determine, by gradually thickening the screening substance, what, as a slow conductor, would be the behaviour of this increased mass towards heat which was being accumulated in its willingly receptive surface, and was being pressed inwards for transmission through the mass by the force of the solar ray behind. I find, as I have abundantly observed in India, that a slow conduct of such solar heat is but a poor principle to rely on alone. Hence it is, that no thickness of masonry roof, and scarcely any reasonable thickness of thatch, will, without great loftiness of rooms, suffice to keep out solar heat at all effectually.

We may next consider experiments designed to correspond in principle with a well-ventilated hat or tent, where a current of air flows between the screening substance and the body to be screened. If a thermometer with a blackened cylindrical bulb of one quarter of an inch in diameter be insulated in the centre of a cylinder five inches long, open at top and bottom, and of half an inch diameter, so that there is about one-eighth of an inch space all round between the thermometer and the cylinder, for a current of air, it will be found that if that cylinder shall consist of only thin paper, coated outwardly with gold leaf or aluminium leaf, or even with tin bronze, it will, in a still atmosphere, arrest from five-eighths to seven-eighths of the sun's direct rays.

If the cylinder be also coated on its inside with any such leaf metal, it will have the retarding effect improved by about a sixth or eighth through the aid of the slow radiation of the interior metallic surface.

If the cylinder be formed of stout cotton cloth of close texture, and having a smooth and purely white surface, such as white satin jean, it also will possess great reflecting power, though many degrees inferior to the metallic face; but a slight discolouration of the surface rapidly diminishes the effect. If it be soiled, as in practice it soon must by dust, &c. to a buff or light brown, it will be found to lose half its virtue. Moreover, although a metallic surface does certainly throw off the sun's rays with an intense brilliancy at the angle of reflection, if the surface be straight in a vertical direction, like the cylinder of a common hat, or the wall of a house or tent, or if it be a horizontal plain above the level of the eye, like the top of a hat or flat roof, such brilliant rays from it cannot be thrown into the eyes of neighbours on the same or a lower level, but will be reflected to the ground from the vertical sides, and to the heavens from the horizontal.

I find a flat sheet of brilliant metal hung vertically out of doors to be very little visible, even at a few paces' distance, especially with a cloudless sky, in whatever position the sun may be, excepting, of course, for a few minutes at sunrise or sunset, when its brilliancy does indeed attest its reflective virtue; but a white surface of equal size is visible and glaring in most positions, reflecting both solar and diffused light in various directions.

Thus we see that, by simply providing that the surfaces shone upon shall not lie in certain planes of reflection, a metallic face, while much more effective than a white one, becomes actually less visible than almost any others.

Again—If the small cylinder around the thermometer be made of brown flock or felt, its power of averting rays is very small; a blackened thermometer bulb, placed centrally within it, will rise to within a few degrees of what a black bulb does when exposed to the sun and sheltered from wind. When cylinders of a darker colour than an earthy-brown are used, the resisting power decreases, but not very materially; a rough brown surface is so penetrable by rays, that it leaves but little room for increase of absorption by darker surfaces.

Neither do we gain much by increasing the thickness of a material and trusting to a slow conduction of heat alone. If we close the bottom of the cylinder and roll it up in a sheet of the thin brown cork of which cork hats are made, so as to envelope it with a dozen layers of cork, far more heat will penetrate in ten minutes through the whole mass, than in as many hours through an open cylinder made of thin paper merely, and faced inside and outside with tin bronze, like the paper used by tea-dealers. In fact, in less than half-an-hour, the thermometer, under the many layers of cork, will rise to within three-fourths of what it will when its blackened bulb is exposed to the full power of the sun; while the thermometer within the metal cylinder will not rise one-third as much.

We have here exemplified the dangerous character of non-reflecting and poorly-ventilated hats.

Even the sola topee—a hat made of that best of slow conductors the pith "sola," which possesses also a smooth white surface—will not protect all constitutions from even that extremity of solar mischief, sun-stroke.

I am informed that officers in Burmah frequently fell under the sun while wearing large "sola" hats. I have known half-castes themselves, (in one instance a very strong man,) who could not, without suffering, expose themselves during a whole day with any ordinary sola hat, unless sheltered with a chattah as well. Where a person is mounted on horse-back, elevation from the ground, but especially the currents of wind on the hat, created by riding, will materially aid the defensive power of such hats; but it is only particular constitutions which can rely on them with any security.

Neither can the slow conduct of the most massive turban, offer, apart from its whiteness, any considerable security. Gradually conducting inwards the solar heat, and detaining the animal heat, though it may ward off the extremity of sun-stroke, and answer for a limited exposure, morning and evening, it cannot fail of permitting a rapid constitutional injury to be produced by much exposure to a mid-day sun.

If we place the bright metal cylinder inside of another cylinder of cork or felt, in substance about twice the thickness of card, and larger than the contained cylinder by one-eighth of an inch all round, for the free ascent of air, the protective effect of the bright cylinder will be actually damaged by the outer cork or felt one, and very materially. The thermometer within the inner metal cylinder will rise, and rapidly, much

higher under this double screen (although the air has a free play between the two cylinders) than if the outer cylinder be removed, and the unaided metallic surface of the inner cylinder is left free to repel the direct rays of the sun. If, in lieu of the inner metallised cylinder, there be placed within the outer felt cylinder a small one composed, like it, of brown felt, the heat-arresting effect of the double felts will be less than of an outer felt and inner metal cylinder. It is much better, however, to have a double layer of any fibrous material, as cloth or felt, with a free way of air between them, than to have the same mass united in a single body. These experiments also show that, in employing hats with double shells or crowns, there is sufficient virtue in interior-metallic surfaces to render it expedient that the inner face of the outer shell, and both faces of the inner shell, should be coated with either tin or aluminium, bronze or gold leaf; the first answers well, and costs almost nothing in the form of tin paper. But, as already remarked, nothing can compensate for the absence of a powerfully reflecting exterior surface, facing the sun—one of bright metal, where it can be employed, or a purely white and smooth cloth, or enamel, where metal cannot be used.

In these experiments with large inclosing cylinders and prisms, it is here proper to note the fact, that there is, in the size of a hat, a limit beyond which any gain from increased freedom of ventilation would be overruled by an increased interception of the solar rays by the enlarged surface, and inward transmission and concentration of much of their heat. In no hat is this limit likely to be reached; but placing a large concave over the head becomes a serious question in the case of umbrellas used as parasols, of parasols themselves, and of chattahs. In the roofs of small boats, and of tents, it is more serious still, owing to the air within them not circulating away freely as with a parasol.

In the experiments with thermometers I was led to try the square prism as well as the cylinder, on account of the tendency of the latter to concentrate the radiations from their inner surface. The fact referred to is this, that while, owing to the sun's great distance, the rays which reach our earth arrive in virtually parallel lines of vibration, if they fall upon a convex surface, especially on a hemisphere like an umbrella, such of the rays as are transmitted to the concave side and radiated from it, are thrown off in rays having a mean direction perpendicular to the concave, and are accumulated, or more thick set, in the space inclosed within the concave surface. This is a serious matter when a person's head is anywhere within that space, and there is not a free flow of air over the inner and outer surfaces of the hemisphere to carry off most of the heat, before it is radiated and concentrated upon the head. Hence, our umbrellas and parasols are very faulty in their form as protectors from the sun, and should always be held at a sufficient distance from the head, that it may be below the conflux of the rays. Much the best form for a parasol would be that of the common Indian chattah used by the poor; namely, a flat circle turned over at the edges. Many a headache would be escaped by the fair population if such a form could but take its well-deserved place as a fashion.

Having referred to but a few only of the experimental data, and touched them too lightly for any clear explanations, I proceed to describe constructions in which, while the teaching of such experiments has been duly

respected, the chief data have been taken from a personal experience of several years in India; not an experience of mere passivity, but of active trial.

Under the head of dress I can do little more, without intruding upon the time due to my other subjects,* than speak of head-dress, and must hasten over the details of it; omitting, indeed, many of them. Permit me to premise, what it is of much importance should be impressed upon the mind, that, while all that is believed to be desirable with respect to weight, bulk, form, &c. is here advocated, it does not follow that the principles themselves should be considered inseparable from such proportions. If we adhere to the principles, they will enable us to carry our restrictions in size and weight, without deadly consequences, further than we can if we rashly reject the principles.

Furthermore, each principle, and the contrivance for giving effect to it, stands so far independent of the rest, that the eye of disfavour cast upon any one, ought not therefore to be turned upon the others. In short, attention is invited to the principles chiefly, and next, to the plans for giving effect to them, rather than to the material accidents under which they are offered to notice.

To employ a hat with two crowns, or shells, having a spacious passage for air between them to carry off, by convection, heat which had penetrated the outer crown, occurred to me between thirty and forty years ago. The first hat I made was helmet-shaped, not unlike the pattern, fig. 2, excepting that it had not the coronet ventilator. With this I travelled over the Himalayas, most of the time on foot, for six months. The next was shaped like a common broad-brimmed hat, and made of the sola pith. The attention of indigo planters and others was invited to it, and the use of such hats has been gradually extended in India. Within a few years a patent has been taken out for the application of this principle by a manufacturer in England. Although the principle is seriously compromised, from the manner in which it is carried out in the patent hat, it is said to be superior to most others in use in India.

To be effective, every tropical hat which has not a metallic or purely white exterior, must, I conceive, have such a double crown, with a free space between the crowns, and a very free outlet at top as well as inlet below, for a current of air which can only thus really act as one of convection, carrying off heat from the outer shell into the atmosphere; otherwise the heated current, if sluggish through the pitifulness of the space and of the outlet at top, will deposit much of the heat upon the inner crown; a fact I have abundantly established by trial.

Also, between the inner crown and the head, there must be ample freedom for the passage up of a far more important current still, namely, one that shall have access to and ventilate the head, as well as sweep away from the inner crown solar heat penetrating it from without. At the same time, this ventilating current must be under absolute control. If, similar to a common hat, the head-dress be given vertical sides and a flat top, a reflecting metallic exterior will be admissible, and a single shell or crown may suffice, provided there be an ample current of ventilation within it;

* The subjects of tents and barracks for British troops in tropical climates, especially in India, were treated of in a subsequent paper.—Ed.

but the additional security of an interior shell is desirable, where the bulk is not objected to.

I proceed to describe, first, a helmet, spheroidal in form, and not metallic at the surface. Of such a helmet I here show a pattern, seen in section in fig. 2.

The first point to be considered is the question of weight; one upon which much has been said, and misconception, lamentable in its consequences, has prevailed. If the head be placed in a box, air-tight, or nearly so, and having a heat-absorbing exterior surface, like a common shako, and pressing also with rigidity and painful constriction round the head, a little marching under a hot sun will cause such a head-dress to feel intolerably weighty, even if it could be made so much lighter than air, that, if it were to escape from the head, it would float away into the heavens.

This sense of weight is produced by solar heat pressing rapidly in and radiated down by the hat, falling like a load upon a head which is oppressed at the same time by the confinement of its own animal heat and perspiration.* Hence in Military as well as Civil life, the real causes of this false impression of heaviness being overlooked, there has been an anxious endeavour to bring the shako down to the least possible weight, every ounce saved being thought a great gain. So likewise we see gentlemen's cork hats in shop windows boastingly poised against, I believe, 4 ounces in a scale. Now I have myself had to remove such a hat from my head oftener in a hot summer's day here, and been more distressed by it than by a helmet (the first of my attempts after a rational construction) when tramping in it by hill sides and even through hot valleys of the Himalayas, although it must have weighed nearly a pound and a half. In short, while the endeavour has been anxiously made to lessen the weight of the shako, if by only an ounce, any fish or fruit-woman in England would be happy for a good day's hire to walk a march with three or four dozen shakos in her basket on her head, if room could be found for them, and any Hindoo milkwoman in India would gladly take half or three-fourths of that number in lieu of the load of milk she will carry on her head from the marshes many a mile into a distant town; but provided always that neither of the women should be required to wear one of the shakos herself. That one shako would assuredly distress her more than all the rest. The fact is, there is no part of the human body that can be more readily exercised to carry weight than the head. In such endurance it surpasses the back and almost equals the shoulders. In all ages and countries it has been instinctively chosen as the seat for loads, especially for loads carried great distances.

While therefore in the head-dress, as in the rifle and everything else a soldier has to carry, all superfluous weight ought undoubtedly to be avoided; while, instead of any such clumsy accumulation of matter, opposed

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to all science, as is a turban, saving its whiteness, the repulsion of solar heat and the dissipation of animal heat ought to be committed to the smallest weight and bulk of matter and the choicest form by which these ends can be thoroughly effected—while this is unquestioned, yet no error can be greater than to put restraint upon any such weight, bulk, and form as are required for perfect efficiency.

Next, with respect to bulk, the utmost size which could be needed would not, if the form be well devised, cause one-half of the uneasiness in a high wind which is produced by a common hat. In a hat, the centre of force of the wind is much above the centre of pressure on the brow, and produces a wrenching action which tends to displace the hat and to render necessary a painful tightness in its fitting, and also, for keeping the hat on, a wearying constriction of the muscles of the brow and head.

It is this leverage which is most trying. In the case of the high bear-skin cap it must have consumed a large part of the effective strength of any soldier marching against a strong breeze. But, if all excess of height in a hat above what is necessary be avoided, and if the breadth of the upper part of a hat or helmet be contracted as far as efficiency will permit, and if the brim have a sufficient breadth and downward bend given to it for protecting the face and sides of the head, it will be found that the surface presented to the air by the brim, which is below the centre of pressure, will equal that presented by the portion of the crown above the centre of pressure. The force of wind then on the brim tending to tilt the hat downwards will balance the leverage of the wind acting on the crown tending to tilt it upwards. In short, the centre of force will correspond with the centre of pressure.

The question of size then is closely allied to that of form. While the hat is on the head, any necessary size will be found to offer little inconvenience provided the form be such that the centres of pressure of the wind upon it, and of it against the head, shall correspond. This pattern helmet is formed of such proportions as carry out this principle.

With respect to form, none will be found quite equal, so far as the action of wind is concerned, to that of a spheroidal or elliptic helmet, having a broad declining brim; and I take leave, on the authority of some of the choicest architectural forms—domes surmounted by a circular gallery, to think that none would wear a more commanding and martial appearance than the elliptic form of a helmet surmounted by a circular coronet, as soon as the eye became familiarized with it. To remove the jockey-cap ugliness of a bald helmet, the ancients surmounted the helmet with the Minerva crest, handsome enough to the eye when edged with richly-projecting mouldings of rigid metal, but exhibiting little sign of utility—the true standard of taste in every manly business. When, however, the Minerva crest is imitated in dull rounded impressible felt or leather, unless necessity in use can be shown for its presence (for then indeed the eye should learn to accept anything), I must think that Phidias, who sculptured, or the artist who designed the ancient crest, would, if now present, implore that helmets might be left bald rather than be surmounted by sausages in lieu of crests. At all events a hollow crest, with a mouth opening forwards and with the passage sloping down backwards, forms a very unsuitable channel for the exit of an internal ventilating current, as will be explained in the sequel.

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In raising this question of taste, I do so with no other object than that of bringing every influence available in support of a ventilating provision which I believe to be most desirable, nay, almost essential for any tropical hat or helmet which is to possess thorough efficiency. I would on no account appear so to trifle with a question of life and death like the present, as, like a man-milliner, to dwell on points of appearance for their own sake, points which every thinking and feeling man must view as altogether insignificant, while fellow-members of his own national family are liable to be called upon devotedly and loyally to expose themselves at a moment's command, and, as a consequence, if fashion and not efficiency in dress be the order of the day, to be one after another dropping down in the apoplectic snort, or one here, and another there, sleeping into death at night, and all of them to be laying in, more or less, the seeds of vital disease!

Whilst, however, a crown of a helmet-form, having a broad inclined brim, is the best with reference to the action of wind, it does not so well admit the employment of a bright reflecting surface for the repulsion of the solar rays, as will be presently considered.

We may now proceed to consider the constructive details for giving effect to the physical provisions requisite for a tropical hat.

Commencing from within, I would beg an especial attention to that part of the hat which applies itself to the head. It should, I conceive, consist of a strong draw-cap, *h h*, fig. 2, resting on the head to carry the weight, and attached around its lower edge to a broad band *H H*, encircling the brow and sides of the head. Both the cap and the band should be made of open and strong fabrics, and be variable in their dimensions. For the cap, I have employed an open made canvass, and for the band an open-made horsehair cloth, as a fabric cool and always clean. The cap and band are of open texture, that the animal exhalations and animal heat may have free exit through them, and that air may freely permeate them to support the respiration of the skin as well as its perspiration. They are strong: the cap, that it may carry the weight of the hat on the head; and the band, that it may keep the hat in rigid lateral security by firmly encircling the head when such security is needful. Lastly, they are variable in dimensions; the draw-cap, that the hat may be so poised as to have its centre of gravity placed well below the centre of support about the head. When this is the case, there will be no necessity excepting on especial occasions, as during action, or in a high wind, for the head to be at all firmly encircled by the band; and even a firmer compression than can ever be needed will produce, owing to the band's pliability adapting it comfortably to the contour of the head, no painful constriction, as is the case with a rigid hat.

The band itself must therefore be variable in its dimensions; not only that the same hat may fit with equal comfort a variety of heads, so that two or three sizes may suit a whole army perfectly, but also that the same wearer may vary the tightness at his pleasure. Ordinarily, in a hot march he would wear the head-band quite loose, but at a moment's notice he should, without removing his hat, be able to make it engirt his head so well as to surpass, in the security of the hold, and without uneasiness, the most painfully constricting hat. This immediate command over the band is effected by means of a strong double-ended cord, *T T*, winding over a

thumb-peg, *V V*, exterior to the hat at the back; which peg revolves over a circular rachet, over the inclines of which it travels easily one way for winding tight, but is detained from revolving back by the upright edges of the rachet. By drawing out the peg a sixth of an inch, it clears the ridges of the rachet, and is turned back for loosening the head-band within the hat.

The importance of such a provision cannot, I believe, be exaggerated. Whatever may be the material, form, or construction of the body of the hat, a porous draw-cap, resting on the head to carry the weight, and a porous and flexible band encircling the head, and momentarily variable in its dimensions, ought to be viewed as a *sine quâ non* for a soldier's head-dress, more especially in the tropics. It is painful to see a serjeant hammering with his palm, that they may fit securely when engaged with the enemy, shakos of one rigid, oval form, upon heads of infinite variety in their contour, and to reflect that during ninety-nine in every hundred hours of their use, no such tightness is necessary if the hat be rightly poised on the head with its centre of gravity low, and there be a loose chin-strap to guard against accidental displacement. With the brow relieved of all constriction, a man can walk without weariness a distance which would utterly exhaust him with a constricted brow and suffocated head.

Exterior to the porous head-band there should be a free space, *f f*, fig. 2, entirely around the head, of from three-eighths to half of an inch wide, both to afford room for the free expansion of the band, and, more especially, for the free passage of a copious current of ventilating air.

Exterior to this air-passage is the shell or crown, *E E*, of the hat (the inner one, where there are two shells). This crown, though larger than the head by three-eighths or half an inch all round, need not rise above it more than one or two inches, and it should have a central aperture at top an inch and a half in diameter to afford to the ventilating current as free a passage for its exit, as that around the head for its entrance.

A free entrance round the head is of little use unless the exit at top be also free, for the ventilating current has various duties to perform, for which it becomes rapidly disqualified by any detention. It ought to cool the head by evaporating away the perspiration, and should, therefore, permit but little of it to assume the form of liquid sweat. It has to feed the pores of the head with oxygenous air, for the skin respires as well as perspires, and it has to sweep away by conduction from the interior surface of the hat such solar heat as has penetrated through it from without,—which heat, if it be not thus carried away by this current, will to a certainty be radiated by the hat upon the head of the wearer, especially if the interior of the hat have not a metallic face. The thinnest coating of leaf gold, aluminium, or even leaf tin, weighing but a few grains, will be found to have some decided effect in checking the radiation inwards, and allowing the ventilating current time to carry off such heat by conduction. This metallic face, also, will not grow soiled by dust or sweat, which can be readily wiped or washed off it—a point of importance in regard to cleanliness and sweetness. The substance itself of this shell or crown should consist of matter which is a slow conductor of heat; or, if there is no shell exterior to it, it ought, I think, to be lined inwardly with wadding or the pith of the Indian reed sola, in order to retard in some degree the conduct

inwards of heat, which lining would of course have the coating of leaf metal over its inner face. The inner shell of this pattern helmet is coated on its outer surface with cork one-eighth of an inch thick, and that faced with leaf metal. Before proceeding further outwards, we have to look to a point of especial importance, and of some mechanical difficulty, namely: how to connect the body of the hat with the flexible head-band carrying the draw-cap, which band is concentric within the hat at a distance of, say, half-an-inch all round, in which space it has to expand and contract towards the centre, and therefore must exercise no tension on the hat itself, which will not contract. Yet the hat must have a firm connexion with the band and cap, the latter having to carry it, and to endure any heavy blows directed upon it without the connexions giving way; and the band, when tightened, having to keep the hat rigidly fixed and equidistant from itself at every point. Lastly, this peculiar provision must be simple, durable, and inexpensive. We have, in this, a mechanical problem of more difficulty than many which are more showy and apparently important in their solution, though few questions can surpass in importance the preservation of the brain in a state of comfort and of consequent efficiency; and nothing can more conduce to its comfort, next to an exclusion of solar heat, than keeping the head as much as possible free from constriction and refreshed by air.

If we take a dozen of stout and stiff wire pins, *R R*, ranging from an inch and a half to two inches and a half long, and with their ends turned into eyes, and attach them in an upright position about two inches apart, each by one eye round the lower edge of the crown of the hat (the short ones behind and the long in front), and by their upper eyes to the upper edge of the head-band at equal distances all round it, we shall have a connection of great strength having these properties between the crown and the head-band,—it might be made to support the hat though a crushing weight were placed on it; and when the head-band was tightened it would resist the lifting of the hat off the head with ample rigidity, since the wires must all of them be bent double first. Again, owing to the length of the wires being fourfold their inclination, a very little angular motion of them inwards and sideways permits the band to contract or enlarge its circle unaffected by the rigidity of the hat containing it. Thus this system of wire rods, freely hinged at top and bottom, gives absolute rigidity against any vertical motion of the hat (that is, against its being forced down or being lifted off), and, at the same time, absolute freedom to the horizontal motion of the head-band in varying its dimensions. But then, without some further provision, the hat would be also free to shake about horizontally. To guard against this: on each side of the head-band, near its front central line *r*, fig. 3, a wire is stitched across it vertically, having eyes at top and bottom, through which stout whipcords *S S* pass horizontally and obliquely to the crown of the hat, to which they are firmly fixed. At the back of the head the band is divided, its two ends overlapping each other. Attached to the band near each of these ends there are similar wires and cords, *f f*, as the front ones, *S S*; but instead of these cords being fixed to the crown of the hat, as at the front, they are formed into loops, to which are hooked two ends of the cord *T T*, pulling in opposite directions sideways, towards

holes in the crown *U U*, through which they pass to meet at the winding peg *V*, already described. As the peg is twisted, it not only tightens the head-band, but, through the tension of the cords laterally, prevents any lateral play of the hinder part of the hat, as well as any motion forwards and backwards, while the cords at the front of the band equally check lateral motion there.

By this adaptation of simple means—much more simple in the construction than in the description of them—a provision is obtained admitting of great strength and durability, of trifling cost, and requiring no more intelligence in the wearer than shall suffice for twisting up the peg one way, and raising and untwisting it the other way—an action any idiot might be taught to perform. Let it be borne in mind that this, or some similar provision better than it, if forthcoming, is necessary to give comfort to the head of the soldier—and how much that comfort comprises!—and furthermore, that it would enable the same sized hat to fit, with equal comfort, all the heads in an army; the only objection to employing one size being the unnecessary bulk in the case of very small heads. Two sizes then, or at most three, would answer thoroughly for all sizes of heads; while, from its flexibility, the band would also adapt itself with equal comfort to heads of every shape.

Reverting again to the body of the hat, if it have two crowns (as in the pattern present, and in the sections, figs. 2 and 3), the inner crown ought, under all circumstances, to have both its surfaces coated with metal; not only the inner one, facing the head, but the outer surface also, which faces the interior of the outer shell: the inner surface, as already stated, that it may not so readily radiate heat upon the head as fibrous surfaces do; and the outer surface, that it may not so readily, as such surfaces also do, imbibe heat radiated from the interior of the outer shell.

Exterior to this inner crown, and over its whole surface, there is an air-space, *A A*, between it and the outer crown, *D D*, three-eighths of an inch wide, which, in the pattern helmet, is extended to the extremity of the brim, it being also double. This double construction of the brim not only gives great strength to it, but it tends also to prevent heat from penetrating to its under surface and being radiated from it upon the face, sides of the head, and neck. A circle of many holes of considerable size around the inner brim admits air of convection, which then passes up between the two crowns to the top of the hat, where it enters a chamber, *B B*, fig. 2, inclosed by a coronet, *b b*, surmounting it. This exterior current of air is not a ventilating current, but solely a current of convection to sweep off from the interior of the outer shell as much heat as it can during its constant ascent.

Becoming thereby much heated, this current is not allowed entrance anywhere into the interior of the head-chamber. It is thus given no opportunity of heating the inner ventilating current until the latter, having done its duty, flows through the central opening, *e*, in the inner crown into the coronet-chamber, *B B*, which is thus an embouchure common to both the interior ventilating and the exterior convecting current.

The coronet is a short cylinder, surrounded by circular holes of three-eighths or half-an-inch in diameter, and it is inclosed by a sliding band

of metal, pierced with corresponding holes. This peculiar construction of a hollow coronet mounted on a helmet, was designed in order to combine, under one simple arrangement, the different provisions necessary for giving adequate and secure vent to currents of air passing up a helmet or hat, and for controlling the current; also to effect this without letting in the sun's rays to the interior of the hat.

In the first place, any ventilation in a tropical climate that does not admit of being very copious, can but partially fulfil its duty; but it is in vain to offer to air a free entrance below, if it is not given a ready vent above. A few mere pinhole-apertures at top are almost useless. Yet free apertures cannot be made either at the top or sides, lest the sun's rays should penetrate them and fall upon the head, or heat the interior of the hat. If the helmet be mounted by a crest, made hollow, with its mouth opening forwards, unless the crest were quite horizontal, and had an opening of equal size facing backwards, it is manifest that even such a moderate pressure of air on its mouth as is produced by walking, would arrest the exit of any inner rising current, created by the mere warmth of the head; while the least breeze would assuredly blow inwards, and, by the shape of the crest, be turned downwards upon the head. It is only at times that the head could endure such a current of wind striking upon it at top. Against such downward blasts it is highly needful to guard. Moreover, where there is a current of convection rising up exterior to and all round an inner crown, such a current requires some circular receptacle for its free admission and discharge into the atmosphere. The current of ventilation, therefore, ought to be under entire control. It oftentimes happens in India, even in the same day, that in the early morning the atmosphere is so cold and charged with penetrating fog that but little current of air could be endured, yet by ten or eleven o'clock the heat becomes so trying that the utmost ventilation possible would be grateful to the head; while between different seasons the extremes are, of course, far greater.

By means of the coronet these several points are, I think it will be admitted, satisfactorily attained. While the central opening in the inner crown is only about an inch and a half in diameter, the coronet is five inches, and being only one inch high, it so overhangs that central opening, that the most oblique rays of the sun cannot shine into the interior of the hat.

Being provided with holes around its entire circumference, in whatever direction the wind may blow, it finds a free passage across the chamber of the coronet, and can never, therefore, have any tendency to blow downwards upon the head; but, on the contrary, it has the peculiar property of any current blowing transversely over an aperture which is giving vent to an ascending current—namely, that of increasing the ascent of the latter by lessening the atmospheric pressure over it. By this arrangement, the utmost freedom possible is given to both the interior ventilating, and the exterior convecting, currents. At the same time, these currents are under immediate and complete control, through the sliding metal band encircling the coronet. By a motion of the thumb-piece on it, the band is turned half-an-inch sideways, and covers all the apertures in the circuit. Thus, without removing the hat, the ascent of air through it can in an instant be lessened or cut off altogether, in accordance with the wearer's sensations.

Proceeding on to the outer crown of the helmet, it is desirable that the

radiating power of its inner surface should be lessened by coating it with a metallic film, that the passage of heat inwards may be, in some degree, retarded.

It is desirable that the body or substance of both this crown and of the inner one should be of a nature slowly conductive of heat; but in warding off heat we must chiefly rely upon the copiousness of the up-draughts of air within each crown, especially of the ventilating draught within the inner one and around the head, and upon the nature of all the surfaces of the crowns, but most especially on the nature of the exterior surface of all.

So far as the great point in a tropical hat—resistance to the entry of solar heat—is concerned, a head-dress cannot be perfect which does not present to the sun's rays a metallic face, that is, it cannot effect its object by means of the simplest construction, and with the smallest weight of matter.*

But then, if it be given the spheroidal form of a helmet, and at the same time a metallic face, it will reflect the sun's rays in a multitude of directions, dazzling the sight of persons far and near; unless indeed their eyes should be guarded with gauze spectacles. A white surface, so long as it is brilliantly white, will be found next to a metallic in reflective efficacy; but, though it does not reflect the solar ray in certain particular directions with at all equal brilliancy to metal, it has the disadvantage of reflecting the rays of both solar and diffused light in a multitude of directions, as already set forth, whatever shape be given to the head-dress. It is in some degree dazzling therefore to beholders placed almost any where around it. Therefore, having, with a view to conciliating military taste, adopted an elliptical or helmet form for the pattern, I have been compelled to relinquish the great advantage of opposing a metallic face to the sun's rays, and, to make up for it, have had to rely upon a combination of every other available agency. A stiffened felt body has been adopted for this pattern on account of the facility with which it can be formed, but, as already shown, it is a most ready receiver of the solar rays; and, though it is supported by cork blocks against the inner crown, it becomes a question how far the stiffening cement would bear the heat in India. But these details do not affect the principles of the construction, for the shell might be formed with advantage, like the first hat I made in India, of cane-work, and be then covered with white cloth, as in the helmets lately used in India. Whatever material is used for the body, since the form is opposed to metallic brightness, it ought to be provided with a tight white cover, which, when at all soiled, may be turned inside out, or exchanged for a fresh clean one. Tightness and smoothness prevent a lodgment of dust, and otherwise favour a surface's maintaining its cleanliness. Moreover a soldier could easily carry with him a spare cover, where they are so small, and could himself wash one, and stretch it on his helmet to dry and bleach in the sun.

With the protection to neighbours of the eyeguards, to be described presently, I do not think one need hesitate to propose maintaining a white exterior to the crown, and no one who has had experimental experience in India can question the reflective value of a purely white surface; though, as was to be anticipated, we are informed that the Commander-in-chief was

* Such a metallic surface may be a mere film of metal leaf on bronze, which would weigh a few grains only, and could not of course feel hot when handled.—J. J.

led to adopt the "carkee," or dust colour, for the dress of the troops, on account of the injurious glare of white.

Aided by a reflecting exterior, the various provisions of this helmet constitute a head-dress which could not, I think, be readily surpassed.*

Lastly, a protection of the eyes from the intense glare in India is greatly needed. Not only does glare, acting through the eyes, aggravate so much the effect of any causes irritating the brain, that, when the irritation becomes serious, absolute darkness has often to be prescribed, but the eyes themselves are weakened by it. Even many of the natives who are much exposed by day, can, at last, only see in a strong light; becoming blind in twilight—suffering from the complaint *nyctalopia*; which has also affected our own soldiers at various times. I cannot imagine that musketry of precision, effective at half a mile, and artillery at two miles or more, can be duly available in the hands of men half blinded by the glare of a hot season in India. However that may be, there can be no doubt that many an inflamed eye would be saved, many a headache would subside on the line of march, instead of terminating seriously; and many a poor fellow kept out of hospital, if he could screen his eyes from an intolerable glare. Now, with such a head-dress as this, it is easy to provide him with eye guards, made of horse-hair net, inclosed in a tough flexible gimped wire, which would prove much less liable to break than spectacles of wire gauze; and would, when not used, lie concealed between the brow and the hat, to which they would be attached by slides. These eye-guards can, either one or both of them, be drawn down in a moment, and as quickly restored to their place. A provision of such importance, so trifling in cost, and admitting of being made very durable, ought surely to be adopted. The eye-guards with which this helmet is provided act, you will observe, quite well, though the first which have been made.

I proceed now to describe a hat, or shako, which, for the wearer's sake, rejoices in a metallic exterior. It is given none but nearly vertical and horizontal faces, (see figs. 4 and 5, showing a side view and section), that, while it is powerfully reflective of heat, it may not throw any rays into the eyes of persons standing either near or far off. Whatever be the altitude of the sun, rays falling upon the horizontal surfaces of the top, the ledge, or the brim, will be thrown upwards above the eyes of neighbours, excepting any much higher, as on horseback, while rays falling on the upright sides will be projected downwards, below them. The hat is made deeper

* I feel it here a duty to express to Messrs. Christy and Co., the great manufacturing firm, not my own obligations only, but, as I believe, those of the public also, whether heed shall be afforded to the effort or not, for their public spirit in producing for me, at no small trouble, those parts of the helmet which belong to their line of work, namely, the outer and inner crowns and brims. Several wooden blocks had to be made, and about a dozen and a half crowns of different materials, from which about five perfect patterns have been produced. The other parts I have obtained elsewhere, and have had the whole put together myself. I have been asked what such helmets would cost. I am not a manufacturer, and I do not suppose without an order adequate for commanding tools and practice, any manufacturer could name the lowest price; but of this I have no doubt, that, if either this or the following hat were to cost 25*s*., the cost would not amount to five per cent. of the value of the lives and constitutions saved, while it would be inestimably surpassed by the moral gain in every sense of the term. Moreover, I think the helmets might easily, and ought hereafter, to be made in India, to give practice and encouragement to native art.—J. J.

at back, that it may be worn quite upright, with its surfaces vertical and horizontal. Indeed, the sides slightly overhang, to insure, at all times, an adequate downward projection of rays from them. The hat is given the peculiar form of steps, that, while its faces are either vertical or horizontal, it may have adequate breadth at bottom for internal freedom around the head, and, at the same time, recede so much in breadth at top that it shall neither be top-heavy, nor present a broad surface to the wind, up above the line of pressure on the brow. This form is also favourable for flexibility. I was informed by a high military authority, that the present desire at the Horse Guards was, not to command for infantry a head-dress made to resist sword-cuts, but one which should possess a flexibility and elasticity which would enable it to endure much crushing and other rude treatment.

Proceeding inwardly, it will be observed, that, relying on the magnificent effect of a good reflecting exterior, and desirous of conciliating, as far as was reasonable, existing impressions respecting size and weight, I have omitted the separate inner crown and the intervening current of convection, although they, in the main, enabled me thirty and more years ago to endure, year by year, an amount of exposure to the sun, which would have been destructive to many a person possessing far greater powers of resistance than I ever enjoyed.

The single crown, then, is lined with wadding in contact with it for a short way up, and then instead of following out the inner angles, the wadding spans across them,* forming a truncated cone, attached at top around the central aperture in the uppermost disc, which discharges the ventilating current.

I have heard that a desire has been expressed in high quarters for a head-dress that shall be suitable alike for the hottest and the coldest climates. This does not at first sight appear agreeable with reason; but if we look closely into principles, we shall find it is. If the question before us had been to provide a head-dress for service in Lapland instead of India, I would say, "take this very hat." The interior of the lining facing the head being metallized, will not invite away heat from the head, the metal being unwilling to absorb its radiations of animal heat. So also the bright exterior of the hat will less readily than any other surface dissipate by radiation, to the region of frost around, animal heat stolen from within; two important provisions. Then merely insert a soft cushion of wadded cotton or lamb's-wool into the already existing space between the head-band and the crown; and if you are actually going to Lapland, fill up the angles of the hat with loose wool, and increase the depth of the flounce round the brim as far as the sides of the face; finishing it in front with open canvas or woollen gauze for a veil. Lastly, insert a drawstring around the lower edge of the flounce, that it may be drawn close up round the neck, sides of the head, and face. With these little alterations the hat will become as well suited for the Arctic regions, as without them it is for the Tropics.

But our immediate concern is with India. The weight of either the helmet or hat with a double shell is about from a pound and a quarter to a pound and a half, with a single shell it is not above a pound. Reduce

* This wadding is not shown in the section, fig. 5.—J. J.

that weight if you will; you see the sizes, reduce them if you will. You see the forms: I cannot think that of the spheroidal helmet with a coronet will encounter displeasure, even though labouring under the disadvantage of novelty; nor would any one question the martial fitness of the rebated one with upright sides, who had himself suffered sun-stroke under fanciful trumpery. Should head-dresses on these principles be adopted, I would exhort those who have authority in the matter, whatever modification in form or reduction in size might be decided on, not to allow alterations to be carried so far as to strangle any of the principles or to eliminate any of the provisions.

The only other point connected with dress to which I can here refer is an especial protection for the back. On the importance of wearing, as a protection against atmospheric heat as well as against chills, soft open flannel next the skin over the whole surface of the body, I have, in the work already referred to, abundantly dwelt, and have mentioned as a fact, from my own experience, that in the hot winds a thermometer placed next the skin will stand many degrees lower under such flannel than where there is nothing but a single cotton dress over it. But to rely as a protection against the sun's rays themselves upon the slow conduct of heat by any amount of clothes touching the body is utterly vain.

If we pad the back of a tunic it will soon become saturated with accumulated ray-heat, which it will then rapidly impart to the body, while it will also suffocate the skin, which will then saturate it with sweat. But a curtain of even single white jean suspended from the shoulders and propped out from them downwards three inches from the back by little bows of steel, so as to permit the air to circulate freely between it and the body, would be found to save much suffering; and if it had, as it easily might, a bright face of tin bronzé, the protection would be complete.

It is not the spinal column, over which nature has placed a mass of bone and muscle, which alone needs protection, but also the skin of the whole back right and left of it, which, being supplied with nerves communicating with the spine, transmits to it and to the brain impressions which are distressing the whole surface of the back.

Uneasiness, terminating at last in sickness, will be felt over the whole back if it be opposed for an hour or less to an ordinary fire, at a distance where the thermometer does not rise above 100 or 110 degrees of our scale. It is surprising then how any European can endure, even for half an hour, the rays of a tropical sun at 160 degrees, rays intense also with chemical influence not possessed by fire rays, an influence, when in excess, so searching to the vital powers! I was myself unable to bear for more than a few minutes an Indian sun shining in its full intensity upon the back, even though the head was well protected by a redoubtable hat, and I was always careful to have intervening between the back and the sun a mat screen, or an Indian "chattah." I never met with an European who could dispense with the chattah and actually allow the sun at an inclination to play upon his back for hours together without soon paying the penalty of such rashness.

Is it not humbling, and something more, to think that had not our British forces been providentially supported by other native troops stepping into the place of those deserting us, and had the latter not been as infatu-

ated in their course of action as in their crime, there was, after our hundred years of experience, or rather existence, in India, no such dress provided as could have saved our gallant countrymen from certain exhaustion, and the nation from being relieved of the charge of India in a very ignominious manner?

In concluding the remarks I have to offer upon dress, which on the present occasion are of necessity much curtailed, I desire to repeat that anything like perfection is not arrogated to the plans I have proposed. No one would be more gratified than myself to see them superseded by any constructions really superior in efficiency, or modified in any degree tending towards it. At the same time, there is not one member of the British public whose opinion is worth a thought, who would not protest against any neglect or strangulation of sound principles in subserviency to accustomed forms or arbitrary notions of military fashion.

The CHAIRMAN said that he had no doubt another opportunity would be afforded to Mr. Jeffreys to read the remainder of his paper on tents and barracks, which was also a subject of great interest. In the meantime, some gentlemen might wish to make some remarks on the head-dress before them.

A MEMBER suggested whether it would not be better to have a lining of green instead of red on the under side of the rim; green was a better colour for the eyes; and asked whether the outside was intended to be metal or felt.

Mr. JEFFREYS said he had no motive in selecting red. He happened to be in possession of the fabric, and he made the other to match it. It would be better to have green. With regard to the outside of a head-dress of that shape, it could not be metal. He proposed to have such a tight white cover as he exhibited, at all times over it. Metal would be most desirable; but the grand objection to metal was that the powerful reflection of the sun's rays from a spheroidal helmet would be too much for the eye.

Captain BURGESS asked what would be the cost of a helmet of the kind exhibited.

Mr. JEFFREYS could not tell; but he believed there would be nothing in the cost that would stand in the way of the adoption of the hat. The cost would not amount to five per cent. of the value of the man saved.

The CHAIRMAN said the paper was one of extreme importance. For many years no attention had been paid to the clothing of soldiers; in fact we had had but one mode of clothing them for all climates, whether for Canada, whether for the East Indies, or whether for home service. We had come to our senses of late years, in consequence of the attention that had been drawn to the subject. Now there was a plan in operation by which the soldier was to be clothed in one way for home stations, in another for India and the tropics, and in another for northern climates. What had fallen from Mr. Jeffreys as to the loss of life in India from sun-stroke was notorious. Anybody who had read the accounts of our campaign in India knew that the loss of life from the effects of the climate exceeded ten times the loss of life which came from contact with the enemy. It was not only humanity, it was common sense, it was absolute economy, to

clothe our soldiers in such a way as to preserve their lives. It was a duty which the country owed to the soldiers to keep them healthy during the time they were employed in the public service. With regard to the helmet before them, which weighed one pound and a half, if it were well poised and well ventilated, the extra half-pound would be nothing upon a man's head. It would be light compared with the one pound helmet, if that was close, confined, and had no ventilation in it. They were deeply indebted to Mr. Jeffreys; and he begged to offer him the thanks of the Institution for the paper which he had read, and to hope he would continue the subject on another occasion.

IRREGULAR TROOPS.*

By Captain G. M. Macaulay, Commandant 1st Scinde Horse.

Much discussion has of late taken place relative to our army, and having to re-organize the Indian portion of it; about which such various opinions have been advocated by the oldest and most distinguished officers, that the subject has been kept before the public much longer than such matters usually are. But the question of the absolute necessity of a Native Army may be said to be affirmatively settled, and the remaining question to decide is, whether we are to have it on the "Regular" or "Irregular" system.

The term "Irregular," though much used, is in many instances little understood, and is at best a vague, and may be said to be a very erroneous, application, and does not convey any definite idea to the uninitiated; and indeed many may be met with, who understand it to mean only a difference in, if not a total absence of, discipline—a conclusion which is not much to be wondered at, when we remember that in India, where the service is best known, many regiments have existed for years without, strictly speaking, any discipline, and a very imperfect organisation, while others have got on with a little of both; that of late years a totally new service has been created, organised on a regular system, with the most perfect discipline: yet all these enjoy the same denomination, "Irregular."

The late General Jacob, who studied this branch of the Indian service most carefully, and, with his rare talents, quickly mastered the peculiarities of the "Irregular," and fully developed the genius of the service, was of opinion that the word "Irregular" should be abolished, and Silidar substituted in its stead. The term "Irregular" is applied to those troops which, for a certain amount of pay, feed, clothe, arm, and equip themselves without further aid from Government; and who usually look on their place in the regiment, or "*assamee*," as so much property, convertible into cash under certain conditions. Being so peculiarly organised, their efficiency must depend on the amount of their pay and the capacity of their commanding officer. Various methods have been adopted by different commanders for aiding the men in fulfilling their contract with Government, and, generally speaking, with tolerable success; but the details of the system introduced by the late General Jacob have been by competent judges admitted to be not only very good, but have also been proved to work well on service.

A few years back the public knew little about our army, nor did they trouble themselves beyond an occasional expression of dissatisfaction at the large sum it annually cost. As to that great force, the Native Army

* Contributed in January, 1861.

of India, nothing was known of it; the mass of the British public were not aware that they were in any way interested in its existence. The events of the last few years have most completely changed this state of affairs; the army now receives some little public attention, and will receive more, as the people feel that a standing army of sufficient strength for the defence of the United Kingdom and Ireland, and the relief of the troops in India, must be always maintained. The strength of such a standing army will be influenced a good deal by the measures which may be adopted for the future government of India.

To the present time those unconnected with, though perhaps interested in, the army were not sufficiently acquainted with military matters to enable them to form an opinion as to its good or bad organisation; but the recent Volunteer movement, affecting, as it does, all classes, is awakening an interest concerning our regular army, and ere long it is probable that a most salutary influence will be brought to bear on it by these "Irregulars;" for such men as enter the Volunteer ranks will not be long ere they master quite enough of military matters to enable them to detect the weak and objectionable points in the organisation of our regular army, and when once this knowledge has extended to the people generally, we shall be obliged to alter its organisation; for, if we wish to have good men, we must in our military, as in all other departments, keep pace with advancing civilization and improve the soldier both in condition and social position, and rules must be framed suitable to those whom we are now taking such pains to educate.

That our present military organisation is defective, I think is sufficiently proved by the acknowledged difficulty the army labours under in obtaining recruits, and the enormous number of desertions. Assuming its organisation to be so defective, it follows that we must not look to it for aid in re-organising our Indian army; but look elsewhere for a system which will produce for us a service which will be eagerly sought after and adapted to our wants.

That any voluntary reform should arise from the Regular Indian Army itself, is, by our present military system, not to be expected; but ere long a reform will be forced upon us, and there is little doubt that, whatever measures may be adopted for its re-organisation, they will be much influenced by the large Irregular Army which has so rapidly sprung up; and, though the force is only in its infancy, still its progress to efficiency will be most rapid, for what will not quickly approach perfection, when the common sense and public opinion of the thinking portion of the English nation are brought to bear on it, aided as the army is by the talent and experience of so many able and distinguished officers.

It has been stated that our system of recruiting is defective: now, the effect here seems to be taken for the cause; for it is but rational to suppose that, if the profession of a soldier be worth following, men will seek it, instead of, as now, being sought for and obtained with difficulty. This proceeding, moreover, compels us to admit into our ranks men, to whom we implicitly trust the guardianship of the honour of the nation, but who would never otherwise get decent employment; for who would dream of taking a man into their private service without a close scrutiny into his

moral character; yet the best of us have been willing enough to see damaged characters enter the army, trusting to example and discipline to reform them; and it says much for the discipline of the service that the great majority of such men are reformed: still this should cease to be; the honour of the British nation should be confided to men of good reputation. No rules that may be enacted will ever prove of much use, until the practice of enlisting damaged characters be abandoned. It may be remembered that the army of the Roman Empire rapidly deteriorated from the period that "debtors" and "criminals" were forced to serve in its ranks; for shortly after their admission, desertions became so frequent that recruits were branded on being enrolled. We have not as yet been reduced to this, but we are not very far behind, for we have been compelled to brand our "deserters;" and, if the statements which have at times appeared in some of the military periodicals and papers are to be depended upon, men so branded are becoming painfully numerous.

It will, I think, be admitted that the enormous number of desertions (about eleven thousand a year) clearly prove that the service is not popular, consequently some organic change must shortly be resorted to, so that the position of a soldier may be rendered enviable, and one that will be eagerly sought after. In speaking on this subject, the late General Jacob observes,—

> Soldiers, like other servants of the State, observe the law of demand and supply, and the supply of soldiers will always be regulated by the rates of wages held out to them, by description and remoteness of the work to be performed, and by the description of the masters to be served for these rates. On this subject, then, we may learn from the manufacturer: if he desire to establish a factory, and to collect and organise the several grades and descriptions of skilled labour implied in this organisation, he proceeds to invite these grades and descriptions at what he believes to be the several market values. If the trade be dangerous, the rates will rise proportionably. If the manufacturer be of ill repute as a master, the collection of servants will be proportionably difficult. If prospects of promotion and pension in case of injury be held out, labour will respond at once to these advantages. Eventually the factory is started, and is maintained simply on the principle of paying every man, from the highest to the lowest engaged therein, what his labour may be worth, and by causing the engaged to feel dismissal from employ as a more or less grievous punishment.
>
> What is to the interest of the manufacturer in the establishment of a factory is to the interest of the State in the establishment of an army. Let the State therefore accord to its soldiers such pay and position as to draw into its ranks the flower of its yeomen and peasantry; train them in accordance with their noble nature, by appealing to the highest and best faculties of man, and arm them with weapons suited to skilful workmen. Let there be regiments of counties—let, that is, each regiment, have permanent headquarters, where a considerable district around might be interested in the conduct of the corps in the field; where recruits might be enlisted, and where families, pensioners, &c. might reside in comfort during the absence of the regiment in the field. Let there be a liberal scale of pensions allowed for all ranks of officers and men, both for wounds and long service. Let the service be such, that dismissal from it may be felt as a grievous punishment. Let promotion to the highest ranks be open to all who may deserve it; let even the Marshal's baton be within the reach of the grasp of the private soldier who may prove himself worthy and able to wield it.

The Regular native army of India when compared with our European army may be said to hold forth some of the inducements here recommended by this officer; for, vast as this native army has been, no difficulty has ever been experienced in obtaining recruits, or suddenly increasing its strength; and this must be attributed to the "rates of wages" and pen-

sions which have been paid; yet these rates, though liberal enough to bring numbers of ordinary soldiers, have not proved sufficiently remunerative in the higher grades to induce men of education or family to enter the regular native army. Had the pay of the native officers been higher, we would doubtless have had a superior class of men filling this very important position.

Desertions from the native army of India are not by any means numerous, and when cases do occur, it will generally be found, that the deserter has committed some offence against either the civil laws or society, and that he has not deserted from dislike of the service.

The law of demand and supply, being of universal application, it follows that what has proved successful in India with the Asiatic, will also succeed with the European; consequently, if rates of pay be granted to the European soldiers in proportion to the work demanded of them, and in proportion to the increased cost of food and clothing, the service would be popular, and recruits forthcoming without trouble, which would enable us to enlist only men of unexceptionable character; and this latter is of more importance than would at first sight appear; for in India, where our European army must always be proportionably small, it is essential that the individuals composing it should set a good moral example, not only to the native troops, but to the inhabitants generally.

The more the subject is reflected upon, the more curious it appears that a great power like the English should have two armies so peculiarly organised, that one should be very popular, while the more important, or the European one, should be looked down upon; and the popularity or otherwise of a service materially affects its efficiency, for a man who voluntarily enters a service, and finds himself well off and respected, will bring all his energies into play to accomplish any undertaking he may be called on to perform, feeling satisfied that every additional success adds to his reputation and position; whereas the same individual if he finds himself in a service which is not appreciated, and which brings him no improved social position, will do his work simply because he is bound and compelled to do it, but not from any high motive or love of the service: and the better educated the soldier becomes, the better able and the more inclined will he be to argue in his own mind the value of the service he may be in, and whether it be worth his while to remain in it, and get his friends and relations into it also, or to get out of it as quickly as possible.

Those acquainted with the subject will agree that, popular as is the "Regular Native Army," the "Irregular Service" is far more so.

By saying that the Irregular service is more popular, I mean that men of a better class, and generally speaking of some little property and education, are found in its ranks, and also that it very rarely happens that the commanding officer of an Irregular regiment is ever obliged to have recourse to the recruiting sergeant, there being almost always a number of lads kept waiting by their relations already in the service, to compete for any vacancy that may occur.

Almost all our Irregulars have been cavalry, and its popularity may be partly attributed to the nature of its organisation, which permits the property in, and sale of, the "assamee." General Jacob remarks on this peculiarity:—

Experience convinces me that the permitting property in and sale of assamees is necessary to the well-being of a Silidar corps. It gives the greatest security for the good conduct of the men, who are not likely to misbehave when they have embarked their whole property in the service. The right of property in the assamees gives a tone to the whole structure of a Silidar corps, without which its greatest strength would be wanting. It is this which makes the best soldiers in India attach themselves to the service, till they look on their regiment as their country, and their place in it as their estate.

Irregular cavalry has always occupied an important position in Asiatic armies. On one occasion, Hyder Ali, the Raja of Mysore, brought eighty thousand cavalry into action. At Assaye, the Mahratta's had thirty thousand. The Raja of Berar, Sindiah, and Holkar could at any moment bring over fifty thousand horsemen into the field.

These numbers not only tend to prove that the service was a popular one, but also that the Generals were of opinion that the nature of the country required that a large portion of their armies should be composed of cavalry; but want of discipline and a leader rendered them useless, for, as a recent writer truly remarks, "Cavalry when badly disciplined and badly led, the more numerous it is, the more useless."

During the late military operations in India consequent on the mutiny, our various Generals were, at times, much crippled for want of cavalry. All our experience of warfare in the East proves that, once a native army be compelled to take the field, their object is to avoid giving battle. Shut up in a fort they will fight well; but, in the open country, they will march incessantly. Such perpetual marching is most harassing to regular troops; rendered more intolerable, as usually happens, by having to pass through a country already devastated by the flying foe.

In 1768, when Colonel Wood wished to draw Hyder into an engagement, his reply was, "Give me troops like yours and I will fight in your way; you will in time come to understand my mode of warfare. Shall I risk my cavalry, which costs one thousand rupees a horse, against your cannon balls, which cost two pence? No, I will march your troops until your legs become the size of your bodies; you shall not have a drop of water, or a blade of grass. I will give you battle, but it must be when I please, not when you please."

This was the system adopted by Tantea Topee, and others of the leaders, during the recent disturbances in India; but, had we had a sufficiency of cavalry, they could not have eluded our troops so frequently as they did: nor, on being driven out of a fort, could they have got off, as they almost invariably did, with comparatively speaking little loss; for it was our want of cavalry alone which prevented our successfully pursuing and effectually dispersing them.

Irregular troops, organised on the system introduced by the late General Jacob, would be the most efficient and most economical description of light troops that we could employ for service in India. Irregular troops organised on his principles, retaining as they do the activity, independence, and readiness of the best Irregulars, with the solid strength, certainty, and steadiness of action of the Regulars, render them of the greatest service in the field, and superior to Regular troops for advance guards, protecting the flanks of an army; or in pursuit, where their celerity of movement alone adds much to their value. It might so happen that, though not of sufficient strength to attack the flying enemy, they would prevent villages being destroyed and the country laid waste, so that supplies for the main

body, containing the valuable, or European, troops, would be easily obtained; for the inhabitants, who are seldom hostile to either army, are at all times willing to supply what they have at a fair remuneration; and Irregulars, having no commissariat to look to, know it to be their own interest to protect, not to injure or plunder, the people of the country through which they pass. A general whose troops are well supplied, moves forward steadily and rapidly. This is half the battle in India, for it has been correctly observed, that an oriental army is more difficult to reach than defeat. When occasion demands that a small force should be employed (which will be the case in India for years to come), it is most important that the troops should arrive at the required spot as quickly after the requisition as possible, for delay in such cases has often led to much inconvenience; besides, it frequently happens that the presence of troops obviates the necessity of having recourse to them. The mobility of Irregulars is here very apparent, for, from the fact of their always keeping up their baggage animals, they can march at a moment's notice; the longest delay that can occur, under any circumstances, would be while the animals were being brought in from their grazing ground.

Irregular troops are also valuable from their (except in very rare instances) existing without any external aid; an instance of their requiring assistance would be that of continued marching through a desert country, but this is a contingency which seldom happens.

Irregular troops are less costly than Regulars; and, taking as an example the Regular and Irregular cavalry of the Bombay presidency, we find that the Regular trooper costs eighty-three rupees, and the Irregular about thirty-six, monthly.

Much might be said, and authorities quoted, to show the political value that Irregular troops have over our native Regulars, a fact which may be partly attributed to the men who enter the Irregular service being, generally speaking, of good family, possessed of some little landed property, of some little education; the native officer being actually an officer, and not so in name only; and the position the service holds in the estimation of the people generally. And the property invested in the service by the Irregular for the purchase of his assamee forms the best possible guarantee for his general good conduct in quarters.

At present the Irregular cavalry soldier is not as well horsed as the Regular. To effect this General Jacobs was of opinion that the pay of the Irregular cavalry soldier should be fifty-eight rupees a month, and remarks that—

> If this rate of pay were granted, a regular Silidar cavalry would speedily be formed very far superior to any native cavalry now existing in the East in every respect, yet costing the State in time of peace nearly less than two-thirds, and in time of war very much less than the present Regular cavalry. No compensation, commissariat charges, pensions, nor any extra allowance whatever, would be required under any circumstances, with the single exception that should the regiment be ordered to proceed on service to Europe, to Egypt, or elsewhere beyond sea, passage for man, horse, followers, and baggage cattle would be supplied by the State.
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> Such a cavalry would be available for service in any part of the world; it would go anywhere, and do anything. Whenever there was purchase in money, it would subsist without any aid but its regular monthly pay; and it would carry with it the greatest military power at the smallest possible cost to the State.

The native standing army of India should be all on the Irregular

principle, and have a larger proportion of cavalry than has hitherto been entertained.

If the police establishment were increased, we could dispense with many soldiers; at all events these latter should never be employed on police duties. As in England, so it should be in India; the soldier and policeman are essentially separate vocations, and if we try to make the native soldier act in a civil capacity, we destroy his efficiency as a soldier, without producing a decent policeman. The natives thoroughly understand the difference between the civil and military powers, and, entertained as police, they have proved economical and very efficient. The discipline of some of the Irregular regiments in India has suffered much from being broken up into small detachments for civil employ.

If I mistake not, an officer of rank has stated relative to the late mutiny in India, "that one portion of the army not having mutinied was only attributable to circumstances." This is doubtless strictly true; consequently it behoves us to have the condition of the native soldier such that it will always be against his interest to mutiny or misbehave in any way: no man understood this better than General Jacob, and it was owing to this principle being well carried out, that the Irregular troops organised and disciplined by him, though originally drawn from the most mutinous district (Delhi) were enabled to look on the mutineers with pity and contempt, to aid in restoring order, and to remain true to their salt, notwithstanding the taunts of the disaffected, the overtures of aid from semi-barbarous though numerous tribes, and the dazzling temptation of the possession of a large province. The principles, it may be asserted, must be good which produced such results.

Here we have a system that has been proved to work well, producing good serviceable soldiers at a moderate expense (good in a political point of view), and, from being economical, suitable to our present financial condition: so we should lose no time in adopting a decided course and put our native army into an efficient state; for it might so happen, that ere long we might be obliged to withdraw European troops, and not only hold India with our natives, but also be glad to accept the services of some of these also; for if we should have occasion to again send troops to Egypt or into Asia Minor, none would be better adapted for service in these countries than our Indian Irregulars; and the political condition of Europe is such, that our state of peace may be converted into war without much warning or time for preparation.

The Journal

OF THE

Royal United Service Institution.

VOL. V. 1862. APPENDIX.

PROCEEDINGS OF THE THIRTY-FIRST ANNIVERSARY MEETING.

THE THIRTY-FIRST ANNIVERSARY MEETING of the Members was held in the Theatre of the INSTITUTION, on Saturday the 1st of March, 1862.

The Right Honourable SIR GEORGE CORNEWALL LEWIS, Bart. M.P., Secretary of State for War, in the Chair.

I. The Minutes of the Proceedings of the last Anniversary Meeting were read.

II. The Annual Report of the COUNCIL was read as follows:

1. The COUNCIL, on presenting the Report of their Proceedings during the year 1861, have the satisfaction of informing the Members that, upon its Thirty-first Anniversary, the ROYAL UNITED SERVICE INSTITUTION is in a position of increasing prosperity and importance.

2. In the course of the past year many alterations and improvements have taken place, by which the departments have been rendered more useful to the members, and the Museum more interesting and instructive. The expense of conducting the ordinary business of the Institution necessarily increases as the number of members augments, and as the Institution and its transactions rise in the estimation of the professions.

Members.

3. During the year ending 31st December, 1861, 305 Members joined the Institution; the loss sustained by death amounts to 97; the withdrawals to 22; and the names of 15 have been removed from the list, in consequence of their subscriptions having remained unpaid for two years and upwards, notwithstanding repeated applications for them; the increase upon the year is therefore 171.

A detailed statement of the changes among the members, and a tabular analysis showing the present and past state of the Institution appear on page xvii.

Finance.

4. The General Abstract of the Accounts of 1861, as audited on the 31st of January, 1862, will be found on the opposite page.

Receipts.

5. The income has exceeded the estimated receipts by £75 9*s*. Sixty-eight Members have in the course of the year raised their Annual Subscriptions from ten shillings to one pound; and eight Life Subscribers have paid the increased Composition of three pounds.

Expenditure.

6. The expenditure has in some cases considerably exceeded the estimate; the Journal by £115, in consequence of some important discussions, and expensive illustrations; postage by £40—this is a charge which will annually increase in proportion to the number of Members who take the Journal, and the number of copies that are transmitted to the Colonies; the Museum by £29; the Lecture Theatre by £29, owing to the necessity of extensive alterations connected with the heating apparatus; the publication of the Annual Report with the Lists of Members by £26.

7. The expense under the head of artificers has exceeded the estimate by £65. The military equipments presented by Foreign Governments have been far more numerous than had been anticipated, and it was necessary to provide for their reception; the house repairs have been greater than usual; and gas has been introduced into additional rooms.

8. On the other hand there has been a small diminution on the estimates in the items of stationery, printing, advertisements, and miscellaneous expenditure, amounting to £55; no payment has been made for the re-print of early numbers of the Journal, and no expense has been incurred for the Naval Department.

Life Subscriptions.

9. The Life Subscriptions received during the year 1861, amounting to £266, have been invested in Government Securities, £79 10*s*. of which have been placed in the Funds since the 1st of January. The sum of

GENERAL ABSTRACT OF THE ACCOUNTS OF THE ROYAL UNITED SERVICE INSTITUTION

FROM 1st JANUARY to 31st DECEMBER, 1861.

EXPENDITURE.	Amount. £	s.	d.
Secretary's Salary	200	0	0
Clerk's do.	72	0	0
Servants' Wages	362	6	0
Do. Clothing	62	12	0
Fuel	55	1	6
Lighting	32	6	6
Insurance	29	5	0
Postage	162	18	10
Assessed Taxes	91	2	9
Income Tax	1	10	0
Parish and Water Rates	104	5	0
Ground Rent	197	7	5
Museum	229	16	9
Library	111	13	7
Advertisements	25	18	3
Artificers	125	8	2
Stamps	3	10	8
Topographical Room	56	14	6
Journals	659	2	9
Pension to Malcolm	20	0	0
Miscellaneous	23	6	5
Domestic Sundries	19	11	4
Stationery, Circulars, &c.	78	16	1
Printing Annual Report and List of Members	124	14	6
Lectures	29	10	0
Theatre, including Repairs	69	8	4
Printing Pamphlet (Description of the Siege of Sevastopol)	21	0	0
Total Expenditure	£2,969	6	4
Cash repaid to Agents, and United Service Institution Western India	17	0	0
Invested in purchase of Stock	615	15	6
Balance at Banker's 31st December, 1861, Life Subscriptions 79 10 0			
Do. do. Income 6 13 0			
	86	3	0
Total	£3,688	4	10

RECEIPTS.	£	s.	d.	Amount. £	s.	d.
Balance at Banker's 31st December, 1860				177	19	10
Annual Subscriptions at 10s. for 1861	867	0	0			
Do. do. above	1,213	8	11			
Do. do. arrears	28	10	0			
Do. do. advance	14	0	0			
				2,122	18	11
Entrance Fees				305	0	0
Donations				5	0	0
Dividends				67	0	8
Sale of Natural History				11	10	0
Sale of Books (Gould's "Birds of Asia")				20	0	0
Sale of Journals				34	10	4
Sale of Sevastopol Model Pamphlets				4	6	0
Sale of Waterloo Model Pamphlets				2	10	0
Remittance from Messrs. Gillander & Co. Calcutta (Error in Account)				0	3	7
Grant from Government				400	0	0
				£3,150	19	4
Life Subscriptions				266	0	0
Sale of Ethnological Collection				271	5	6
Total				£3,688	4	10

London, 31st January, 1862.

Examined and found correct,

J. E. A. DOLBY,
THO. SMITH,
HENRY F. DOWNES,
HENRY ELLIOT,
} Auditors.

£271 5*s*. 6*d*., realised by the sale of Chinese and Indian Curiosities, has also been invested.

The Funded Property of the Institution in Three per Cent. Consols is therefore £2,932 4*s*. 7*d*.

Estimate of Probable Receipts and Expenditure.

Expenditure.	Amount. £	s.	d.	Receipts.	Amount. £	s.	d.
Secretary's Salary	200	0	0	Annual Subscriptions:			
Accountant's do.	90	0	0	At 10*s*. £850 0 0			
Servants' Wages	365	0	0	Above 1,350 0 0			
Servants' Clothing	45	0	0		2,200	0	0
Fuel	55	0	0	Entrance Fees	250	0	0
Lighting	35	0	0	Dividends	84	0	0
Insurance	29	0	0	Sale of Journals	25	0	0
Rent	200	0	0		2,559	0	0
Rates and Taxes	200	0	0				
Pension to Malcolm	20	0	0	Grant from Government	400	0	0
Printing Annual Report and List of Members	90	0	0				
Library	110	0	0				
Lectures	30	0	0				
Journals	700	0	0				
Printing, Circulars, and Stationery	60	0	0				
Postage	180	0	0				
Advertisements	30	0	0				
Museum	100	0	0				
Topographical Room	10	0	0				
Naval Department	100	0	0				
Artificers	130	0	0				
Miscellaneous	50	0	0				
Domestic Sundries	20	0	0				
Reprint of Early Numbers of the Journal	50	0	0				
Stamps	3	0	0				
Roof of Waterloo Room	10	0	0				
	2,912	0	0				
Balance	47	0	0				
Total	£2,959	0	0	Total	£2,959	0	0

10. In submitting the above estimate, the Council direct attention to the proposed increase in the salary of the Clerk. The financial details, involving a great amount of business, have been conducted entirely by Mr. Felstead, and the Council are much indebted to him for the energy and ability he has ever shown in promoting the interests of the Institution. The Council recommend that he shall in future be designated "the Accountant," and that he shall be required to give approved security for the amount of £200.

The Journal.

11. The success which attends the publication of the Journal, is amply proved by the importance of the subjects contained in its pages,

and by the anxiety shown by the Officers of both Services, especially those stationed in distant parts of the world, to possess it. An officer, writing recently from abroad, thus expresses himself:—

> The Journal fills up a want long felt in the Service, viz., that of a purely scientific Journal connected with the Naval and Military Professions, enabling officers to keep pace with the times, which they would otherwise have much difficulty in doing in these days of progress, when everything connected with the profession advances with such giant strides.

12. This Periodical has proved of great value to the Institution, and the COUNCIL have much satisfaction in noticing that its free transmission abroad, without further charge than the small Annual Subscription, has been recognised as a great boon. This liberal policy has induced 102 officers serving in the Colonies to become Members in the course of last year, viz. 15 from Ceylon, 55 from India, 10 from the Cape, 3 from the West Indies, 3 from the Mauritius, and 16 from the Mediterranean.

LECTURES.

13. The COUNCIL acknowledge their obligations to those gentlemen who contributed papers upon professional subjects during the past season. The great changes which have taken place in the construction of ships and forts to resist the increased power of new projectiles, gave rise to considerable discussion. At a period when science is undergoing such rapid development in all that appertains to war, the advantages of such papers and discussions are evident.

LIBRARY.

14. The library has been increased by the addition of many useful and important works; a new edition of the "Encyclopædia Britannica" has been purchased, and several foreign governments continue to transmit their naval and military journals.

TOPOGRAPHICAL DEPARTMENT.

15. The arrangement of this department is nearly complete, and a new catalogue has been commenced under the superintendence of an officer connected with the Topographical Department of the War Office, who has kindly volunteered his services. The publications of the War Department and Admiralty are regularly presented, and to the former the COUNCIL are further indebted, for a series of photographs of ordnance and military *matériel*.

MUSEUM.

16. Since the last Report, the COUNCIL have received from the War Departments of the following European States, namely, Bavaria, Portugal, Russia, Saxony, Spain, and Sweden, as well as the United States of America, donations of arms, clothing, and field equipment. This collection now contains specimens of all the minute details which constitute the equipmen

of the soldier in most of the Continental Armies, as well as in that of Great Britain. The COUNCIL have purchased of Her Majesty's Government a Model, constructed by the Royal Engineers, illustrating the attack and defence of a Fortified Town, and other Models of an instructive character. A beautiful Collection of Models of various descriptions of Ordnance has been deposited in the Institution by Colonel Tylden, Royal Artillery.

17. The Indian Government have presented a number of weapons taken in India during the mutiny and disarmament of the native population, consisting of matchlocks, swords, spears, daggers, shields, &c., forming a valuable addition to the Indian armoury already in the Museum.

18. In pursuance of a Resolution adopted at the Annual Meeting last year, the COUNCIL have disposed of the Collection of Chinese and Indian Curiosities which had no military interest; increased space is therefore now available for objects of a professional character.

TRAFALGAR MODEL.

19. The COUNCIL have the satisfaction of announcing that this Model, representing the commencement of the battle of Trafalgar, has been completed, and placed upon the table made of oak from the "Victory," and that it is now ready for exhibition. It had been the intention of the COUNCIL to have solicited the gracious presence of Her Majesty to inspect the model before it was open to the public; but the painful circumstances hereafter referred to have deprived the Institution of this honour.*

PATRON.

20. It is the painful duty of the COUNCIL to record in their Report the calamity which the Nation has sustained by the death of His Royal Highness the Prince Consort, who, in 1841, became Joint-Patron with Her Majesty.

21. His Royal Highness, ever an earnest promoter of Science, Art, and Literature, took a lively interest in the progress of this Institution, and in the development of the sciences which it is engaged in advancing. He cordially approved of the alterations which have taken place in recent years, by which the business of the Institution has been concentrated upon those professional matters to which it alone is devoted. The Institution is indebted to the Prince Consort for donations both to the Library and Museum, but more particularly for the advice and assistance he has occasionally given to the COUNCIL, in conducting arrangements which have proved of so much advantage.

22. The President and COUNCIL, acting on behalf of the Members,

* This model was executed by Mr. Dighton (modeller to His Royal Highness the late Prince Consort), 12, College Street, Westminster.—ED.

forwarded to the Secretary of State, for presentation to Her Majesty, the following Address of Condolence :—

MAY IT PLEASE YOUR MAJESTY,

We, the President and COUNCIL of the ROYAL UNITED SERVICE INSTITUTION desire to offer to your Majesty our respectful sympathy, and the expression of our deep sorrow for the irreparable loss which your Majesty and the Nation have sustained by the death of His Royal Highness the Prince Consort.

The Institution which we represent, which aspires to preserve the records of the memorable actions performed by your Majesty's Military Services, and to promote the advancement of Military Science among the members of those services, early received the attention of His Royal Highness. To him this Institution is indebted for a liberal and discriminating patronage and for valuable advice.

This assistance from His Royal Highness we had hoped we might have long enjoyed; but, since it has otherwise seemed good to Providence, we humbly hope, that, in addition to those consolations of higher order which a gracious God can alone bestow, your Majesty may have the gratification of witnessing the more perfect development, the increased and more acknowledged usefulness, of those Institutions which met with the encouragement of His Royal Highness's favour.

For the President and COUNCIL of the ROYAL UNITED SERVICE INSTITUTION,

(Signed) NORTHUMBERLAND.

Alnwick Castle, January 9th, 1862.

VICE-PATRONS.

23. The COUNCIL with great concern record the deaths of three of the Vice-Patrons.

General Sir Howard Douglas, G.C.B., was one of the founders of the Institution. It fell to his lot, from the scientific character he held in his profession, to be selected by his distinguished colleagues to be Chairman of the Meeting at which the foundation of the Institution was both proposed in 1829 and confirmed in 1831. Sir Howard was the author of works on Military Bridges, and on Naval Gunnery (for important improvements in which the nation is indebted to him); he served with distinction in the Peninsular War, and was employed in organizing the Spanish Guerilla System; he also held the appointment of Lieutenant-Governor of New Brunswick, and of Lord High Commissioner of the Ionian Islands.

24. In Lord Herbert, late Secretary of State for War, the Institution has lost a sincere supporter. No civilian, perhaps, ever entered so minutely into the details of the Army, or devoted himself more zealously to its welfare; he fully appreciated the merits of the Institution, and recognised the benefit conferred upon the Services by the circulation of scientific information.

25. Sir James Graham, though he did not take any active cognizance of the affairs of the Institution, twice occupied the position of First Lord of the Admiralty, and other high offices of state.

Vice-President.

26. Vice-Admiral Sir Thomas Herbert, K.C.B., to the great regret of the Council, died last year; he served for some years as Member of the Council and twice as its Chairman; he was an active promoter of the interests of the Institution, and in him the Council have lost one of their most efficient Naval Members.

International Exhibition.

27. When it was decided by the Royal Commissioners to form a Military Class in the International Exhibition of 1862, they requested the Secretary of State for War to nominate a Committee to conduct the details. Lord Herbert referred the communication to the Council of this Institution, and requested them to undertake the duties. A Committee was accordingly appointed, composed of Members of the Institution. A Naval Committee was also appointed, and both these Committees have held their sittings in the Council Room of the Institution.

Honorary Members.

28. Several gentlemen not Members of the Institution were subsequently placed upon the Committees for superintending the Naval and Military Classes of the Exhibition, and the Council have had much pleasure in electing them Honorary Members, viz.: John Anderson, Esq., Royal Arsenal, Woolwich; William Fairbairn, Esq., F.R.S.; Captain Frederick Arrow; Captain Mark Close; John Laird, Esq., M.P.; Clifford Wigram, Esq. They have also elected the Baron Von Usedom, Minister from Prussia to the German Diet, and once Envoy Extraordinary to England, an Honorary Member, and Lieut.-Colonel N. de Novitzky, of the Russian Embassy, a Corresponding Member of the Institution.

Corresponding Members of Council.

29. The revival of the appointment of Corresponding Members of Council has been most successful. Ninety-four officers have kindly given their services, who, by circulating the Proceedings of the Institution and pointing out its advantages, have induced many of their comrades to become Members.

In conclusion.—The renewed instances of recognition of the valuable character of the Royal United Service Institution by the Government, the Professional Departments, and by the Officers of all branches of the Naval and Military Services, warrant the Council in anticipating a continuance of that success which has hitherto crowned their efforts.

III. Lieutenant-General Sir H. J. W. BENTINCK, K.C.B.—

GENTLEMEN,—You have all heard the Report which has just been read, and I need not take up your time by making a speech upon the subject; I will therefore only request that this Report be adopted and printed for circulation among the Members.

Sir SIBBALD SCOTT, Bart.—

I have the honour to second that Motion.

The CHAIRMAN—

I have received a communication from Commander Gardiner, R.N., respecting the expense of printing the Journal. Perhaps, as a point of form, I ought to read it before this Resolution is put:—

"I protest against the accounts being passed as they now stand.

"1st. Because the expenses attending the printing and issuing of a periodical called 'The Journal,' for the use of a minority of the Members, are charged in the general accounts of the Corporation.

"2nd. Because this Journal is not self-supporting, the consequence is that the non-subscribers to the Journal (that is, the majority of the Members of the Corporation) are made to pay the difference, which difference appears to be as follows:—

	£	s.	d.
"Journal - - - - - - - - -	659	2	9
"Postage of same - - - - - - - -	162	18	10
	822	1	7
"1,213 persons subscribing to Journal at 10s. - -	606	10	0
	£215	11	7

"WM. GARDINER,
"5, Upper Bedford Place, Russell Square.

"1 March, 1862."

I will now put the first Resolution: "That the Report now read be adopted."

W. STIRLING LACON, Esq.—

I am very sorry, Mr. Chairman, that General Lindsay, who could have answered this question most thoroughly, is not here, having been called away suddenly last night. He was in possession of the whole of the information on the subject. Commander Gardiner states in that protest that the cost of the Journal is £659. Now I find that the number of Members who have increased their subscriptions from 10s. to £1 is 1,327, which of course at 10s. is £663 10s. Thirty Life Members have also increased their Subscriptions 10s. per annum, making a total increase of £678 10s. Therefore the sum of money which the Institution gets by these increased subscriptions is £19 10s. more than the cost of the Journal.* (Hear, hear.)

The Resolution was put and carried unanimously.

IV. The names of eight Members retiring from the COUNCIL were read as follows:—

Lieut.-Colonel READ.	J. BARROW, Esq. F.R.S.
Captain PACKE.	Major-General WATKINS.
Lieut.-Colonel KEPPEL.	Captain TYLER, R.E.
Capt. SIR W. WISEMAN, Bart. R.N.	Major PORTER, R.E.

* For particulars of the relative cost and advantages of the Journal, Members are referred to the speech of General Lindsay at the General Meeting in 1861, Vol. IV. page 9, and to the fact that the Journal is supplied free of cost to all Members, of both Services, serving abroad, without any increase of their subscriptions.—ED.

Colonel WILBRAHAM, C.B.—

MR. CHAIRMAN AND GENTLEMEN, I beg to propose the second Resolution, which is to this effect: "That the thanks of this Meeting be given to the Members of the COUNCIL who retire by rotation, and that the following Members be elected to fill the vacancies:—

Captain PACKE.	For Re-election.	Captain F. CRAUFURD, R.N.
Captain TYLER, R.E.		Captain Sir JOHN HAY, Bart., R.N., C.B., M.P.
Major PORTER, R.E.		
Captain PETRIE, 14th Reg. Topog. Staff.		Captain TARLETON, R.N., C.B., A.D.C. to the Queen.
Captain MALTON, Dumfriesshire Militia.		

It is unnecessary to make any remarks, except just to say that the progress which this Institution has made, shows how well the Members of the COUNCIL have deserved the thanks which are proposed to them. (Applause.)

Major SUTHERLAND—

I beg to second the Resolution.

The Resolution was then put from the Chair and unanimously carried.

V. Rear-Admiral Sir GEORGE BACK, D.C.L.—

I beg to propose that the thanks of this Meeting be given to the Auditors for their valuable services, and that the following gentlemen be elected for the ensuing year:—

THOS. SMITH, Esq.	H. F. DOWNES, Esq.
Captain J. E. A. DOLBY.	HENRY ELLIOTT, Esq. (re-elected).

I beg leave to say that more efficient Auditors could not be found.

Captain SWEENY, R.N.—

In seconding this Resolution, I most cheerfully and willingly acknowledge the benefits and advantages of the services afforded us by the Auditors of this valuable Institution. While doing so I must take the liberty of expressing I am sure not only my individual obligation, but the general feeling of gratitude which exists to the Right Honourable the Secretary for War, who has done us the favour of presiding on this occasion.

The Resolution was put from the Chair and carried unanimously.

VI. The CHAIRMAN—

There are some proposed alterations in the Laws of the Institution, which the Secretary will read.

The SECRETARY—

The proposed alteration in the Laws, section II., para. 1, is that, "After the words 'and Volunteer Corps,' the following words be inserted: 'Also the Master, Deputy Master, and Elder Brethren of the Trinity House shall be entitled to become Members *without ballot*, on payment of the Entrance Fee and Annual Subscription.'"

Colonel YORKE, F.R.S.—

Mr. CHAIRMAN, notice of that Resolution has been given by the COUNCIL, according to the rules, but since putting up that Resolution in the rooms of the Institution it has been found by the COUNCIL that it would be more consistent with our rules as they

stand to make a slight amendment. It has been thought better to bring in the Master and Elder Brethren of the Trinity House in the 2nd paragraph of the 2nd section, instead of the 1st. The reason for that is, that the 1st paragraph relates to individuals who all of them hold commissions under the Queen, and they are admissible *without ballot*, whereas the 2nd paragraph relates to other functionaries who are eligible to become Members *by ballot*. That comprises the whole of the alteration. I therefore beg to propose an amendment to that Resolution, notice of which has been given; and it would stand in this way, that the words "The Master, Deputy Master, and Elder Brethren of the Trinity House," be inserted after the words "Military Departments," in paragraph 2, section II., instead of in paragraph 1.

W. S. LACON, Esq.—

I beg to second the Amendment.

The CHAIRMAN—

Probably the best course would be to withdraw the first motion altogether, and to put your motion. That would effect your object.

The Amendment proposed by Colonel YORKE was then put to the Meeting, and carried unanimously.

The CHAIRMAN—

There is another Amendment in section vi. paragraph 5: "That, instead of the words 'and estimate of the probable expense for the ensuing year shall be printed and circulated among the Members,' the following words be inserted: 'and estimate of the probable receipts and expenditure for the ensuing year shall be printed and placed in the Library and Reading Rooms, and may be obtained by the Members upon application to the Secretary.'"

Captain FISHBOURNE, R.N. C.B.—

The object of that Resolution is to prevent the necessity of a large expenditure that is quite useless—viz., sending the Reports before the Annual Meeting to the Members. The Report will be sent after the General Meeting; the Members will receive them just the same, but at half the expense to the Institution.

The Resolution was put from the Chair, and carried unanimously.

The CHAIRMAN announced that the business of the Meeting was ended.

(Signed) G. C. LEWIS, Chairman.
B. BURGESS, Capt., Sec.

Captain FISHBOURNE—

I beg to propose that Sir John Burgoyne do take the Chair.

The Chair was then taken by General Sir JOHN BURGOYNE, Bart. G.C.B. R.E.

General Sir JOHN AITCHISON, K.C.B.—

GENTLEMEN.—A Resolution has been put in my hands, which I will now read, and which I am quite sure will receive the very cordial support of the Meeting. It is:—

"That the thanks of this Meeting be given to the Right Hon. Sir George Cornewall Lewis, for his kindness in presiding in the Chair." (Applause.)

It must be gratifying to every old Member of this Institution to see that it has now

taken the place which it was always hoped it might—namely, that of a National Institution. When the War Minister, who presides so beneficially for both Services, and gives an earnest of following the steps of his predecessor, meets us upon this occasion, I am quite sure that you will realize all the expectations which you can possibly have made of any officer of the Government in his position. We have to thank him; for in the first place he was most punctual to the hour—in the next place he has been very economical in the time, by suggesting the reading over the totals of the amounts, instead of the details. I, therefore, move that the cordial thanks of this Meeting be given to the Chairman.

Colonel R. A. SHAFTO ADAIR, F.R.S.—

I am quite sure that, in rising to second the motion that has been proposed by the gallant General—of thanks to the Right Hon. Gentleman who has done us the honour of presiding this day—that I shall carry with me the whole feeling of the Meeting. In regard, first of all, to his official character, we rejoice on all occasions to see amongst us the representatives of a Government which has extended so liberal a support to this Institution, which was established by the officers of both Services in their private capacity. And, indeed, I am sure it is to the Meeting a subject of additional gratification, that the Right Hon. Gentleman has not contented himself with simply an official supervision, so to speak, but that he has made himself acquainted with the reasons which justified us in suggesting, and Her Majesty's Government in giving, support to this Institution. He has visited this Institution on several occasions, and I am quite sure that he has received the impressions which we desire to convey—that in this Institution we form a nucleus for the scientific contributions of Her Majesty's Forces by land and sea throughout the globe. For I take it to be of immense value that in this centre—this military centre as we may say, as well as commercial centre of England—in this military centre every officer has the means of referring, as far as our powers have yet extended, to the records of former times, and to those contributions which occasionally we receive from officers associated with the Services. I have had occasion before to refer, and I will refer again for one moment, to the great advantage we derive from such contributions. All officers—especially those familiar with our Indian wars—will recollect how many occasions there have been within their knowledge when contributions of a scientific character from military officers in India, and also from those officers who have taken part in expeditions into neighbouring countries in the East, would have been of infinite value to us. I have seen plans made by travellers across the snowy ranges of the Himalaya, and in various other directions, which may be of exceeding value hereafter, should warlike operations necessitate our referring to such a source, or peaceful operations by which we may propose to extend our commerce. This has constituted an object of the Institution, and I am glad to find that Her Majesty's Government has been disposed to recognise it; and I cannot but think, that the more the official members of Her Majesty's Government have the opportunity of seeing the way in which the patronage of the Government is laid out, the more they will acknowledge that we do not in any degree abuse the trust they have placed in us. I have especial satisfaction also in seconding the Vote that the thanks of the Meeting be given to the Right Hon. Gentleman, because, dependent as all branches of both Services are on the thorough appreciation of, on the results of, the *exact sciences*, there is perhaps no official gentleman whose previous training has more fitted him for office, or who gives more frequent—I may almost say daily—proof of the attention he has paid to these *exact sciences* than the Right Hon. Gentleman to whom I now second the Vote of Thanks.

The CHAIRMAN—

GENTLEMEN.—It is unnecessary to go through the form of holding up your hands to this Resolution. I assume that it is passed by acclamation. (Applause.)

Sir GEORGE CORNEWALL LEWIS—

SIR JOHN BURGOYNE AND GENTLEMEN.—In rising to thank you for the honour which you have done me in passing this motion of thanks, I will only say that, during the short period in which I have held my present office, it has given me great

satisfaction to contribute, so far as I have been able, to the well-being of this Institution, the character of which I fully appreciate. I recognise the usefulness of the design, and as long as I retain my office I shall feel great satisfaction in doing anything in my power which may contribute to the prosperity of the Institution. I have great gratification in saying that the benefits of the relations between this Institution and the Government have not been one-sided; but that the Government on a late occasion received assistance from this Society, by some information with respect to a part in North America, at a time when we contemplated the unhappy event of a rupture with the United States. That danger, I am happy to say, has now passed over, and we look forward to uninterrupted peace and amity with that important Power; at the same time we feel the advantage which we derived from having access to the well-stored special library of this Institution, furnishing us with information of which the Government may, at a moment of emergency, not be in possession (cheers). Gentlemen, in hearing this Report read, there is much which is cheering with regard to the operation and prospects of this Institution; but there is a melancholy list which the obituary of its Members contains. In the first place there is the much revered name of the Prince Consort, who was a Patron of this Institution, who was also a benefactor of the Institution, and who took an especial interest in all that concerned military science and the perfecting of the organization both of the Army and the Navy. There is no person who ever had the honour of being in familiar relation with his Royal Highness, who is not aware how much of his thoughts were bestowed upon these important subjects, and how great the proficiency which he had made in the scientific study of all that concerned the organization of the Army and Navy. Sir, I really believe that if it had so happened that his Royal Highness had entered the Army or Navy as a subaltern, he would have risen to the greatest distinction in either branch of the service, and I think I shall meet with assent from all persons who know, by intercourse with him, the great ability of his Royal Highness, his remarkable power of mastering all practical subjects, and his great skill in all that related to the manipulation both of Military and Naval matters, when I say that if his lot had been cast in a private station of life, and if he had entered any profession without any external advantages whatever, he would, simply by his own exertions, have risen to the head of that profession (cheers). That is a remark which I think every person who was acquainted with his Royal Highness must assent to, and which, I believe, must be admitted to be a very rare tribute of praise to be conferred on any person in that elevated sphere of life.

Well, Sir, besides his Royal Highness, we have to lament the death of Sir Howard Douglas, who certainly died at a very mature age, but who was a most distinguished officer, and who rose by his services to the highest rank in his own profession, and who also enriched the military literature of his country by valuable scientific treatises (cheers). Besides Sir Howard Douglas, the Society has peculiarly to lament my predecessor in office, of whom, indeed, I feel myself an unworthy successor; I mean the late Lord Herbert. Lord Herbert, with an ample fortune, and with great social powers, and under many circumstances which might have tempted a person of less ardent mind to abstain from the labour which he underwent, had thoroughly mastered the whole mechanism of the Army; he knew it, as few persons who have not the advantage of a professional life ever do know such a subject. He had devoted a large portion of his thoughts and time to the amelioration of our military system; all persons, I think, who have watched his career, both in office and in Parliament, must be aware how diligently he had studied that subject, and with how constant and eager a zeal he pursued what he considered to be the amelioration and increase of the efficiency of the Army (cheers).

Well, Sir, after Lord Herbert we must lament the death of another distinguished Member of this Institution—I mean the late Sir James Graham. Sir James Graham, although a man more advanced in life than Lord Herbert, died still far from the natural term of his existence; and his death was sudden. He is also deeply to be lamented by all those who wished to see in Parliament a man who was thoroughly acquainted with naval and military subjects. His acquaintance with naval subjects was owing to his having been twice First Lord of the Admiralty. But he had likewise devoted much attention to military subjects, and presided in nearly the last year of his life over an important Committee of the House of Commons on matters of military organization. He was well versed in all that concerned the system of our Army.

There is another name which I ought not to pass over, inasmuch as he was an active

Member of the Council of this Institution, and he also represented what none of the other persons whom I have hitherto named did represent, namely, its naval interests—I mean the late Sir Thomas Herbert, a distinguished member of the naval profession (applause).

Well, Sir, it is sad to enumerate so many losses of distinguished Members of the Institution, but we have one consideration which may afford us comfort,—which is, that though names of great weight have been withdrawn from our rolls, nevertheless, in actual numbers, the Institution has increased. On the first of January, 1861, the number of members was 3,518; on the first of January last it was 3,689; showing an increase of 171 members upon the year, which must, I think, be considered as a large increase, and as testifying to the advantages of this institution, and also—what I am afraid does not always accompany utility—the recognition of them (applause).

Gentlemen, it has been customary for the Chairman on these occasions to offer to the Members some general remarks upon the nature and effect of the Institution, and I should be unwilling to depart from that useful and advantageous custom. The object of the Society, as has been well stated by my friend who seconded the motion of thanks to me, and as is also apparent from your Report—the main object of this Institution is the promotion of naval and military science. This is not in the nature of a club, nor merely to promote meetings of Members, nor is it merely a museum, or simply a library, or merely a place for delivering lectures on scientific subjects; but it is a combination of these different branches for the purpose of promoting naval and military science (applause). Now it might perhaps seem to a superficial observer that there is scarcely anything which less admits of being reduced into the form of a science than war. It might be thought that war was a coarse, and brutal, and sanguinary pursuit, and that science would shrink away from all contact with anything so contaminating; now, gentlemen, if anybody should maintain such a proposition, he would maintain a proposition the very reverse of truth. For all experience has shown, from the earliest times, that no subject admits of more scientific treatment, and there is no subject in which success is more intimately connected with science and skill, than the conduct of war. If we go back into antiquity, perhaps the first important military nation that existed were the Spartans. We know how much of their ascendancy in Greece was owing to their well-organised, well-trained infantry—the heavy-armed soldier of the Spartans. We know how the small body of heroes at Thermopylæ, the recital of whose heroism it is now scarcely possible to read without emotion, were able to resist the myriads of Persians who opposed them, and all died upon the field in defence of their country.

The next great military nation of antiquity were the Romans. The Romans owed their great power, and were enabled to conquer the entire civilized world, not by their numbers, but by their military science. It was by the constant training of their skilled soldiers—it was by their system of castrametation—it was by having a regular army and general commanders competent to the work of war—that they were enabled to overcome the whole civilized world.

Now, in order to illustrate what I have just been saying, and to show the very business-like way in which the Romans went to work in the affairs of war—how much they trusted to fieldworks, and to the fortifications of their camps, and the various things that would naturally escape the attention of a mere rude Oriental soldier—I will read, with your permission, a passage from the history of the Jews by Josephus, in which he expresses his admiration of the military system of the Romans, and describes it at some length. He thus illustrates, in a few lines, their military system. He says: "Each legionary soldier is armed with a helmet, a breastplate, and two swords, one considerably longer than the other; besides which he carries a spear and an oblong shield, together with the following articles: A saw, a basket, a spade, an axe, a leathern thong, a sickle, a chain, and provisions for three days. So that his load is scarcely less than that of a beast of burden." Such was the load of a Roman soldier, whom you may remember Virgil describes as surprising the enemy, notwithstanding the large weight which he carried:

> "Injusto sub fasce viam cum carpit, et hosti
> Ante expectatum patriis stat in agmine castris."

Although he laboured under these disadvantages, nevertheless he was active in the march and efficient in the field. But it must be admitted, I think, that the Roman kit was of considerable weight, and that the modern soldier has nothing to envy him in the weight which he carried in the field.

Well, gentlemen, I think no one will dispute that in antiquity it was the science of war that gave the predominance to the great military nation, and not the numbers of their population.

But when we come to modern times, what do we see with regard to the progress of military science? What do we see with respect to that great invention, the invention of gunpowder? The invention of gunpowder was followed by the invention of the gun; and any person who is acquainted with history must at once see that these two inventions have changed the whole face not only of military science, but also of the political world. It has been remarked by a great writer that the history of military science is a constant history of the encroachment of the means of attack upon the means of defence—that, as military science is more perfected, attack becomes more formidable, and defence less easy. That remark applies particularly to the great inventions of gunpowder and artillery. Places which were defensible in antiquity—which might have set almost the whole world at defiance—are now, by means of an efficient battery-train, breached in a short time, and easily taken. Formerly, any person who was able to build a castle with strong walls, and to surround himself with an armed force covered with breastplates and helmets and greaves, was enabled to crush the liberties of a small community, and to set all attack at defiance. It was the great facility of defence and the feebleness of attack which rendered the tyranny of a few so much easier in antiquity and in the middle ages, before the invention of gunpowder, than it is at present. The invention of gunpowder and the perfection of artillery has had the constant effect not only of perfecting the science of war, but also has exercised a perpetually increasing effect upon the liberties and the government of mankind. (Applause.)

Now, with respect to the remark, which seems to me to be a just one, that the progress of military and naval science tends constantly to make attack more efficient and defence more difficult, I will call your attention to the great improvements in artillery during the last few years, the substitution of the rifle in our infantry for the smooth-bore musket, and the improvements introduced by Sir W. Armstrong in our heavy ordnance. We have, fortunately, perhaps I may say, not had any opportunity of trying these important inventions and improvements on a large scale. But I think it would be universally admitted that the tendency of these improvements has been to render attack more formidable and defence more difficult. There was one invention last year which perhaps may be considered as about equally balanced between attack and defence; I mean the plated ships—iron-clad ships. Now it seems to be established by the recent experiments at Shoeburyness, that the iron-plated ships can resist the most formidable artillery, even at a short distance; but a ship cannot be considered merely like a fort—simply for the purposes of defence, it may be used for purposes of offence; and an iron-clad ship may perhaps run under a battery, and be the means of making a formidable attack upon a wall from the sea to an extent which has never hitherto been attempted. Therefore I do not think that it can be said that this very important invention is any instance against the truth of the dictum, that military science tends to make defence on the whole less easy as compared with attack. Well, gentlemen, perhaps any person who looks at this tendency of military science may say, "Yes, we admit that war is the subject of scientific treatment, and that the army which is the best organised, and the best drilled, and the best armed, and the best commanded, although it may be inferior in numbers to the opposing force, will, nevertheless, prevail;" and may admit that a similar remark applies to a navy; "but then," he may say, "you are the enemies of civilization and of humanity in increasing the destructiveness of all those warlike implements." I entirely differ from that view; I dispute the truth of any such remark; and, although it may seem paradoxical, I venture to assert that it is for the interest of humanity that war should be made as murderous as possible. (Hear, hear.) The great object of a nation when it goes to war is to bring that war to as speedy a termination as possible; and in order to make war short, in order to make it decisive, the weapons of war ought to be effective and capable of producing that effect at which war aims, namely, the destruction of the enemy. Well, in illustration of that, which I conceive to be an undeniable truth, I would ask any gentleman to contrast such a war as the Thirty Years' War, which lasted nearly the third of a century, which was marked at every period of its progress by the devastation of provinces, by the burning of towns, by the destruction of human life, by famine, by disease, by injuries to the civil population, and by every misfortune and every evil that can afflict an unhappy country;—I ask any gentleman to contrast a

war of that character, during the rude period of warfare, when it was carried on feebly and with ineffective organisation and unimproved arms—I ask him to contrast such a war as that with the war which took place two years ago in the north of Italy: it was sharp, it was short, it was in the nature almost of a duel between the two opposing armies, it lasted but a short time, the loss of life was confined to the combatants, and it did little injury to the theatre of war. (Cheers.) I think if any gentleman compares those two events he must bear tribute to what I conceive to be the truth, that it is for the interest of mankind that all the appliances of war should be made perfect, in order that when that great calamity comes (for all persons, whether they be soldiers or sailors, or whether they be civilians, must regard war as a great calamity) it may be brought to as speedy a decision as possible. (Applause). The means by which, in our modern communities, we bring about that result, is by having a trained body of men in the permanent employment of the State, commanded by officers who give their entire time to their profession, who make a profession of the science of war, and who, in their studies and in their pursuits, are assisted by such knowledge as it is the object of *this Institution* to promote (Hear, hear). Gentlemen, without a standing army, and, if I may use the expression, a standing navy, it is impossible that these results should be produced. We know, however, that at former periods of our history great objection was made to the institution of a standing army. It was thought that it was impossible to reconcile public liberty with a standing and organised body of armed men constantly in the pay of the head of the State. Well, gentlemen, I will not affirm that our ancestors, who were sturdy maintainers of liberty, and who created a system of which we enjoy the inheritance—I will not maintain that they were at that time wrong in their jealousy, or that their fears were exaggerated. There is no doubt that on the Continent the liberties of many nations were put down by a standing army; but in modern times in this country we are enabled to reconcile the maintenance of a standing army with the perfectly assured maintenance of public liberty. We are therefore enabled to enjoy what appears to me the inestimable advantage of a standing army conducted and commanded on scientific principles of warfare without any danger or harm to our Constitution. Nobody in these days—no rational man—entertains any fear that, for example, His Royal Highness the Duke of Cambridge would march at the head of a battalion of the Guards into the House of Commons and order the mace to be removed from the table (laughter). The soldiers and officers of our Army and our Navy, in following their profession, never for a moment forget that they are citizens and subjects. Whatever fears, therefore, well grounded as they may have been at one time, may have been entertained with regard to the unconstitutional effects of a standing army, all those fears have now entirely vanished. We are able to enjoy, at the same time and concurrently, those two great advantages, the maintenance of our civil and public liberties and the continuance of an army trained, disciplined, and commanded by officers thoroughly conversant with all the branches of their profession, and a large number of whom have profited by the most advanced lessons of military science. Gentlemen, I am afraid I have encroached on your time at more length than I intended to do when I rose, but before I sit down I will only repeat my conviction of the benefits conferred upon the Army and Navy more especially, but generally also upon the public, by *this Institution*; and whatever opportunities I may have of contributing to its welfare I shall always make use of them.

Statement of Changes among the Members since 1st January, 1861:—

	Life.	Annual.	Total.
Number of Members on 1st January, 1861 .	833	+ 2685	= 3518
Do. who have joined during 1861 .	18	287	305
	851	2972	3823
Changed from Annual to Life . . .	+ 8	—8	
	859	2964	3823
Deduct—Deaths during 1861 . .	26	71	
Withdrawals . . .		22	
Struck off . . .		15	
	26	108	134
Number of Members on 1st January, 1862 .	833	2856	3689

TABULAR ANALYSIS OF THE STATE OF THE INSTITUTION, To the 31st of December, 1861.

Year. 1st Jan. to 31st Dec.	Annual Subs. received.	Entrance Fees.	Income (from all sources).*	Life Subs. received.	Amount of Stock.	Invested in the purchase of Books, &c.	No. of Vols. in Library.	No. of Members on the 31st Dec.	Number of Visitors.
	£	£	£	£	£	£			
1831	654	..	654	1,194	..	..	..	1,437	..
1832	1,146	..	1,146	973	..	..	..	2,699	..
1833	1,405	..	1,450	692	..	..	..	3,341	..
1834	1,500	..	1,549	583	1,100	..	..	3,748	13,376
1835	1,480	..	1,574	366	2,430	40	..	4,155	8,537
1836	1,570	..	1,682	330	3,747	45	..	4,069	8,521
1837	1,549	..	1,747	222	4,747	180	..	4,164	10,907
1838	1,462	..	1,634	230	5,500	246	..	4,175	15,788
1839	1,399	..	1,565	168	5,500	292 .	..	4,186	16,248
1840	1,363	..	1,525	198	5,500	446	5,500	4,257	17,120
1841	1,450	..	1,643	186	6,000	243	5,850	4,243	19,421
1842	1,373	..	1,565	144	6,400	373	6,450	4,127	21,552
1843	1,299	..	1,494	140	6,700	237	7,000	4,078	27,056
1844	1,274	..	1,408	112	3,000	298	7,850	3,968	22,767
1845	1,313	..	1,466	228	1,500	127	8,100	3,988	21,627
1846	1,298	..	1,456	138	1,500	74	8,410	4,031	32,885
1847	1,314	74	1,502	132	1,700	37	..	4,017	38,699
1848	1,175	57	1,375	48	1,700	85	9,641	3,947	37,140
1849	1,176	72	1,375	84	1,150	58	..	3,970	33,333
1850	1,141	106	1,294	198	600	36	..	3,998	33,773
1851	1,136	131	1,292	66	666	34	10,150	3,188	52,173
1852	1,134	133	1,281	114	200	43	10,300	3,078	20,609
1853	1,243	319	1,684	264	528	41	10,420	3,251	25,952
1854	1,200	138	1,368	126	612	95	10,587	3,171	22,661
1855	1,159	107	1,289	120	653	55	10,780	3,131	14,778
1856	1,216	197	1,519	156	761	47	10,832	3,204	16,184
1857	1,258	176	1,937	78	1,038	40	10,960	3,168	12,755
1858	1,318	221	2,102	105	438	31	11,062	3,246	25,747
1859	1,526	195	2,277	512	946	70	11,320	3,344	28,739
1860	1,961	298	3,577	397	2,178	114	11,517	3,518	28,011
1861	2,122	305	2,899	266	2,846	99	11,812	3,689	23,296

* Including Annual Subscriptions, Entrance Fees, Donations, Legacies, and Interest on Funded Property; and also the grant from Government, commencing in 1857.

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	£	s.	d.		£	s.	d.
Ramsay, Wm., Rear-Admiral .	2	0	0	Torrens, R. H., Cornet 2nd Dragoon Guards	3	0	0

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WHO JOINED THE INSTITUTION BETWEEN THE 18TH FEBRUARY AND 4TH MARCH, 1861

(Accidentally omitted at Page 121, Vol. V.)

ANNUAL.

De Robeck, H. St. J. Lieut. Royal Navy
Halsted, G. A. Capt. Royal Navy, 1*l.*
Humfrey, C. A. Lieut. 92nd Highlanders, 1*l.*
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ALSO BETWEEN THE 9TH JULY AND 31ST DECEMBER, 1861.

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Suggestions for the More Systematic Instructions of an Administrative Battalion of Rifle Volunteers. Pamph. 8vo. *The Author.*

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APPEAL from Major-General P. de la Motte, C.B., to the Right Hon. Sir Henry Hardinge, G.C.B., Governor-General of India, in Reply to Mr. Willoughby's Letter from the Bombay Government, 30th April, 1844. Pamph. 8vo. With Sketch of the Roads leading from Sowarpoor to Monohur. *Major Watkins, Bombay Artil.*

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BRITISH ASSOCIATION for the Advancement of Science, Report of. 1 Vol. 8vo. Oxford, 1861. *The Association.*

BRITISH MUSEUM. A List of the Books of Reference in the Reading Room of the Museum. 1 Vol. 8vo. London, 1859. *The Secretary.*

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Cornet.

J. W. Hozier

3rd (King's Own) Hussars.

Captain.

*W. M. Bell

4th (The Queen's Own) Hussars.

Colonel.

Sir J. H. Grant, G.C.B. m.-g

Captains.

C. A. G. Browne
A. G. M. Moore

Lieutenant.

C. M. Calderon

Paymaster.

G. T. George. m

5th (or Royal Irish) Lancers.

Colonel.

Sir J. C. Chatterton, Bart. K.H. l.-g

Lieut.-Colonel.

R. Portal

6th (Inniskilling) Dragoons.

Colonel.

T. Marten, K.H. m.-g

Captain.

T. E. Anderson

7th (The Queen's Own) Hussars.

Colonel.

Sir W. Tuyll, K.C.H. g

Major.

*H. A. Trevelyan

Captain.

J. Aytoun

Lieutenant.

Hon. A. W. E. M. Herbert

Cornet.

E. H. Kennard

8th (The King's Royal Irish) Hussars.

Colonel.

G. C. Earl of Lucan, K.C.B. l.-g

Lieut.-Colonel.

R. de Salis, C.B

Major.

T. C. W. Heneage

Captains.

G. G. Clowes. m
W. Mussenden

Lieutenant.

*W. T. Goldsworthy

9th (Queen's Royal) Lancers.

Colonel.

Sir J. W. Sleigh, K.C.B. g

Major.

*A. F. Steele. l.-c

Captain.

F. Ellis

Cornet.

C. E. Martyn

10th (The Prince of Wales's Own Royal Regiment. Hussars.

Colonel.

H. B. Earl Beauchamp. g

Lieut.-Colonel.

*V. Baker

Captains.

H. A. Bowyer
Lord R. D. Kerr

Cornets.

A. W. Edgell
J. C. Russell

11th (Prince Albert's Own) Hussars.

Colonel.

J.T. Earl of Cardigan, K.C.B. l.-g

Captains.

E. Harnett
A. B. Bingham
A. P. Garnett
A. C. Tempest
R. J. Somers
G. C. Robinson

Lieutenant.

P. P. Mosley

Veterinary Surgeon.

P. Anthony

12th (Prince of Wales's Royal) Lancers.

Captain.

J. Cuninghame

13th Hussars.

Colonel.

A. T. Maclean. m.g

Major.

F. D. Maclean

14th (The King's) Hussars.

Colonel.

W. Beckwith, K.H. m.-g

Lieut-Colonel.

Sir Wm. Russell, Bart., C.B.

Major.

P. S. Thompson. l.-c

Lieutenant.

E. E. D. Boycott

15th (The King's) Hussars.

Colonel.

E. W. Bouverie. l.-g

Lieut.-Colonel.

F. W. J. Fitz-Wygram

16th (Queen's) Lancers.

Colonel.

Hon. Sir E. Cust, K.C.H. l.-g

Captain.

L. Halton

Lieutenant.

G. J. Gilbard

Paymaster.

*G. F. Rosser. m

17th Lancers.

Colonel.

Sir J. M. Wallace, K.H. l.-g

Lieutenant.

G. J. B. Bruce

18th Hussars.

Colonel.

E. Byam. l.-g

Lieut-Colonel.

*R. Knox

Captain.

W. Palliser

Lieutenant.

T. P. H. M. Filgate

19th Hussars.

Nil

20th Hussars.

Nil

21st Hussars.

Nil

Royal Artillery.

Colonels-Commandants.

J. W. Tobin. g
T. J. Forbes. g
Sir H. D. Ross, G.C.B. g
G. Turner, C.B. l.-g
SirR.W.Gardiner,K.C.B. K.C.H. g
P. M. Wallace l.-g
R. Jones l.-g
SirE.C.Whinyates,K.C.B.,K.H.l.-g
Sir J. Michell, K.C.B. l.-g
W. G. Power, C.B., K.H. g
G. Cobbe l.-g
A. C. Mercer l.-g
Sir W. M. G. Colebrooke, C.B., K.H. l.-g
W. Cator, C.B. l.-g
H. A. Scott. m.-g

Colonels.

H. Pester
H. Palliser
B. Cuppage
R. Burn
D. Thorndike
E. N. Wilford
A. Tulloh
H. G. Teesdale
N. T. Lake, C.B
J. Hill
H. J. Morris
J. St. George, C.B
W. R. Nedham
E. C. Warde, C.B
J. W. Ormsby
A. J. Taylor
G. Maclean
W. H. Askwith
F. Dunlop, C.B
T. Dick
C. J. Dalton
F. M. Eardley Wilmot
J. W. Fitzmayer, C.B.
G. R. H. Kennedy
C. V. Cockburn
G. Gambier, C.B

Lieut.-Colonels.

E. W. Crofton, C.B. c
H. Aylmer. c
*A. Irving, C.B. c
J. N. A. Freese, C.B. c
F. D. Cleaveland. c
T. Elwyn. c
C. J. Wright. c
P. Maclean. c
W. T. Crawford, C.B. c
W. Henderson. c
W. J. Smythe. c
W. B. Gardner. c
J. H. Lefroy. c
C. J. B. Riddell, C.B. c
E. Price, C.B. c
J. W. Domville. c
E. Wodehouse, C.B. c
*E. Maberly, C.B. c
W. M. H. Dixon. c
G. Graydon. c
J. B. Dennis
A. H. Graham
J. M. Adye, C.B. c
C. W. Younghusband
H. Clerk
F. B. Ward
R. F. Mountain
H. F. Strange, C.B

Captains.

B. Lawson. m
E. A. Williams. m
J. Desborough. l.-c
E. B. Hamley. l.-c
C. J. Strange. m
A. C. Gleig
G. H. Vesey
H. A. Vernon
G. H. L. Milman. m
J. F. L. Baddeley. l.-c
H. A. Smyth
P. W. Phillipps
H. L. Chermside. m
W. C. L. Blosse
S. E. Gordon. l.-c
*N. S. K. Bayly
G. Barstow. m
J. E. Thring. m
H. Bent
H. J. W. Jervis
W. E. M. Reilly. m
H. T. Fitz-Hugh. m
A. M. Calvert
O'B. B. Woolsey
A. W. Drayson
C. W. Elgee
G. H. A. Forbes
J. E. Michell. l.-c
G. C. Henry. m
T. P. Warlow
C. E. Mainwaring
W. J. Grimston
Hon. L. A. Addington
P. J. Campbell
R. Curtis. m
E. J. Bruce
J. E. Hope. m

Second Captains.

V.C. F. Miller. m
C. H. Owen. m
G. A. Milman. m

G. M. Pasley
T. L. Dames
W. G. Andrews. m
H. L. Balfour
*R. Oldfield
J. S. Stirling
W. A. F. Strangways
W. M. Yonge
C. B. Brackenbury
F. Lyon
A. H. Hutchinson
J. T. Daubuz
M. F. Downes
H. T. Arbuthnot. m
F. W. De Winton
L. Griffiths
C. D. Gilmour
W. B. E. Ellis

Lieutenants.

C. R. Franklen
S. A. Bazelgette
J. R. King
E. M'Laughlin
E. Staveley
L. H. H. Parsons
R. W. Phipps
J. C. Cavendish
B. L. Forster
F. S. Stoney
E. T. Warry
W. M. Tolner
H. A. Tracey
W. Strahan
E. W. Sandys
F. S. Le Grice
H. M. Hozier
C. H. F. Ellis
F. T. Lloyd
J. Sladen
E. H. Wickham
C. Bent

Paymasters.

D. A. Patterson, Capt.
*H. L. De-la-Chaumette, Capt.
C. B. Piers, Capt.

Assistant Surgeons.

R. D. Burn, M.D
A. S. K. Prescott

Royal Engineers.

Colonels-Commandants.

Sir G. Whitmore, K.C.H. g
Sir J. F. Burgoyne, Bt., G.C.B. g
C. G. Ellicombe, C.B. g
J. Oldfield, K.H. l.-g
Sir J. M. F. Smith, K.H. l.-g
Sir H. D. Jones, G.C.B. l.-g
W. C. Ward. l.-g
W. R. Ord. l.-g

Colonels.

W. B. Marlow
B. S. Stehelin
H. O. Crawley
J. Walpole
E. Frome
C. E. Wilkinson
W. E. D. Broughton
G. Burgmann
Sir W. T. Denison, K.C.B

Lieut.-Colonels.

Sir H. James. c
W. Robinson. c
T. R. Mould. c
H. D. Harness, C.B. c
E. T. Ford. c
W. Yolland. c
C. E. Ford. c
R. C. Moody. c
F. A. Yorke. c
C. F. Skyring. c
R. G. Hamilton. c
J. W. Gordon, C.B. c
P. J. Bainbrigge. c
J. Cameron
J. S. Hawkins
C. Fanshawe
F. E. Chapman, C.B. c
S. Westmacott
H. St. G. Ord
J. L. A. Simmons, C.B. c
G. C. Baillie
*T. B. Collinson

Captains.

J. Bayly. m
H. C. C. Owen, C.B. c
W. F. D. Jervois. l.-c
Hon. H. F. Keane. m
C. J. Gibb. m
W. D. Gossett
D. Galton
H. Y. D. Scott
G. Ross
J. W. Lovell, C.B. m
M. H. Synge
E. W. Ward
J. M. Grant
F. Fowke
C. R. Binney
W. L. Morrison
A. C. Cooke. m
T. Inglis
C. S. Hutchinson
H. Wray
C. Pasley
H. W. Tyler
J. C. B. De Butts
W. S. Stace
E. Stanton, C.B. l.-c
R. D. Kerr
C. C. Chesney
C. B. Ewart. m
C. B. P. N. H. Nugent. m
E. Belfield
Hon. G. Wrottesley
W. Porter. m
J. J. Wilson
H. T. Siborne
L. Nicholson, C.B. l.-c
F. E. Cox. m
S. B. Farrell
R. H. Stotherd
H. Schaw
G. H. Gordon

Second Captains.

F. H. de Vere. m
A. A'Court Fisher, C.B. l.-c
C. E. Cumberland. m
A. S. Creyke
G. R. Lempriere
W. O. Lennox. l.-c
A. Leahy. m
E. F. Du Cane
W. Crossman
W. D. Marsh
W. I. Stuart. m
J. C. Cowell. m
G. Graham. l.-c
C. E. Harvey
G. Philips
*J. M. C. Drake
E. R. James
J. B. Edwards. m
A. De C. Scott
A. R. Lempriere
C. P. Carey

Lieutenants.

Hon. W. Le P. Trench
D. G. W. Moncrieff
*M. C. Molesworth
*P. G. L. Smith
E. R. Festing
A. E. Lockhart
P. Decie
E. S. Tyler
E. T. Brooke
A. T. Storer
D. C. Walker
R. Home
H. Locock
R. O. Jones
A. May
A. Parnell
A. C. Hamilton
H. P. Coles
C. Crawford
F. A. Le Mesurier
C. R. T. Davidson
J. A. Mellar
W. Salmond
C. Warren
R. S. Sitwell
W. J. Carroll
G. E. Grover
W. R. Slacke
J. H. Smith
H. Robinson

Military Train.

Colonel-Commandant.

J. C. Kennedy, C.B

Captain.

T. Fletcher

Grenadier Guards.

Colonel.

Lieut.-Colonel.

J. A. Lambert. c

Majors.

Hon. H. H. M. Percy. c
E. G. Wynyard. c
Hon. R. W. P. Curzon, C.B. c

Captains and Lieut.-Colonels.

VC M. Bruce
T. S. Conway, C.B. c
C. L. B. Maitland. c
Lord A. Hay. c
H.S.H. Prince of Saxe Weimar, C.B. c
Lord F. J. FitzRoy
H. F. Ponsonby. c
C. G. Ellison
J. F. Cust
A. C. Cure
J. H. King
W. H. B. De Horsey
G. W. A. Higginson
A. H. L. Fox
C. W. Randolph
E. H. Cooper
E. S. Burnaby
VC Sir C. Russell, Bart.
C. N. Hogge
S. Burrard
F. C. Keppel
W. A. M. Barnard
C. Alexander
J. Murray

C. N. Sturt
H. W. Verschoyle
F. T. A. H. Bathurst
A. E. V. Ponsonby
R. Anstruther
R. W. Hamilton

Lieutenants and Captains.

F. A. T. Clayton
T. H. Bramston
R. L. O. Pearson. m
W. S. Ewart
F. G. Stapleton
G. A. Ferguson
Earl of Carrick
H. C. E. Malet
Hon. J. C. Stanley
E. W. L. Wynne
•W. Earle
C. Gascoigne
F. W. Visct. Hood
W. L. Stuckley
E. H. Clive
H. F. Davies
Hon. S. C. G. H. Tracy
W. H. Parnell
R. N. C. D. Lowe. m
A. W. Thynne
P. Smith
R. J. Buller
A. C. H. D. Pennant
L. G. Phillips
•J. J. Johnstone
Hon. A. Annesley
Hon. W. E. Sackville-West
H. O. Gould
E. S. Bridges
Hon. C. E. Edgecumbe
Hon. N. C. Melville
A. D. Hayter
A. M. Byng
C. B. Jarrett
T. F. Fairfax
E. C. Nugent
R. T. L. Norton
H. H. Cholmeley

Ensigns and Lieutenants.

C. Fludyer
Visct. Hinchinbrook
Hon. F. A. Stanley
Visct. Mahon
Visct. Uffington
H. W. Hope
Hon. C. G. C. Eliot
J. T. R. L. Fox
L. R. Seymour
H. R. Clinton
R. C. De G. Vyner
Hon. W. S. D. Home
C. J. Herbert
H. A. Coventry
W. Duberley
A. L. Ricardo
C. E. H. Stanley
Hon. C. F. Crichton
W. L. Latour

Quartermaster.

J. Atkinson

Battalion Surgeon.

C. R. Nicoll

Assistant-Surgeons.

H. J. H. Lawrence
C. C. Read

Coldstream Guards.

Colonel.

Colin Lord Clyde, G.C.B. g

Lieut.-Colonel.

S. Perceval. c

Majors.

T. M. Steele, C.B. c
W. M. Wood. c

Captains and Lieut.-Colonels.

D. W. Carleton
A. St. G. H. Stepney. c
J. T. Airey, C.B. c
W. G. Dawkins
C. W. Strong
Hon. A. E. Hardinge, C.B. c
Hon. P. R. B. Fielding
W. H. Reeve
C. Baring
Hon. H. W. J. Byng
J. H. Le Couteur
H. Armytage
F. G. L. Goodlake
H. Tower
Viscount Dangan
A. J. Freemantle
Lord E. H. B. G. Cecil

Lieutenants and Captains.

C. E. Blackett
Hon. W. G. Boyle. m
F. J. A. Conolly. m
Viscount Holmesdale
C. Greenhill
H. C. Jervoise
Hon. H. W. Campbell
J. H. Hall
G. J. Wigram
A. Lambton
P. Le B. Egerton
Hon. W. Edwardes
H. J. B. Lane
W. F. E. Seymour
Hon. E. H. Legge
E. S. P. Burnell
Hon. G. H. W. Windsor Clive
R. H. Thursby
N. Burnand
•W. Wynne
F. W. Freemantle
F. C. Buller
E. P. F. Reeve
H. Bonham Carter

Ensigns and Lieutenants.

H. G. Fortescue
H. A. Herbert
D. H. Baring
C. W. Lee-Mainwaring
Hon. V. Dawson
Sir E. A. Hamilton, Bart.

Surgeon-Major.

J. Monro

Battalion-Surgeon.

J. Wyatt

Scots Fusilier Guards.

Colonel.

H. R. Highness George Duke of Cambridge, K.G., K.P., G.C.B., G.C.M.G. g

Lieut.-Colonel.

W. J. Ridley. c

Majors.

F. Seymour, C.B. c
J. H. E. Dalrymple. c

Captains and Lieut.-Colonels.

H. P. De Bathe. c
F. C. A. Stephenson, C.B. c
H. P. Hepburn
Hon. R. Charteris
H. G. Wilkinson
W. F. Lord Abinger
A. W. H. Meyrick
W. Aitchinson
E. Neville
R. Gipps
Hon. W. C. W. Coke
F. Baring
H. C. Fletcher
J. R. Farquharson
R. H. White
F. Lambton
Hon. R. Mostyn
A. C. Campbell
C. G. Tottenham

Lieutenants and Captains

G. G. Gordon
Hon. C. R. Hay
•G. H. Moncrieff
D. H. Blair
E. M. Beresford
C. L. Peel
H. Jelf Sharp
J. Paynter
G. W. Knox
•Hon. W. R. Trefusis
G. W. Beaumont
R. A. Cooper
W. S. Rooke
C. Shelley
Hon. J. F. B. Elphinstone
F. Palmer
Hon. L. E. Massey
C. P. Pemberton
H. G. Bowden
J. E. Ford
S. V. Stephenson
C. W. White
W. C. C. Elwes
H. H. D. Stracey
R. A. Dalzell

Ensigns and Lieutenants.

Sir R. A. Cunliffe, Bart.
G. Smith
A. A. Spiers
S. J. Ram
H. Farquharson
Hon. C. I. Shore
J. H. W. Thomas
Marquis of Tullibardine
F. St. J. N. Barne
F. H. Harford
Earl of Dunmore
Hon. G. G. Craven
C. A. Wynne
W. R. M. Wynne
C. E. Phipps

Surgeon-Major.

J. A. Bostock

Assistant-Surgeons.

A. G. Elkington
F. B. Baker
H. Turner

1st (The Royal) Regiment.

Colonel.

Right Hon. Sir E. Blakeney, G.C.B., G.C.H. g

Ensign.

1 T. Atkinson

2nd (Queen's Royals).

Colonel.

J. Spink, K.H., l.-g

Lieut.-Colonels.

2 R. Bruce
1 T. Addison, C.B.

Captain.

1 C. Gibb

Lieutenants.

2 G. Turnor
1 T. Kelly

Ensigns.

1 A. F. Twyford
2 W. C. Hood

Paymaster.

2 R. H. Simpson

3rd (The Buffs).

Colonel.

Hon. C. Grey: l.-g

Captains.

2 J. S. Gordon
2 C. K. Pearson
2 *H. R. Cowell

Lieutenant.

2 L. St. Aubyn

4th (King's Own).

Colonel.

Sir J. Bell, G.C.B. g

Majors.

1 T. Martin
1 W. G. Cameron
2 O. Y. Cocks

Captain.

2 W. Congreve

Lieutenant.

2 E. Chinn

5th (Northumberland Fusiliers).

Colonel.

W. L. Walton. l.g

Lieut.-Colonel.

2 J. A. V. Kirkland

Major.

2 J. C. Bartley

Captains.

1 T. S. Bigge
1 F. H. Pender
2 J. W. D. Adair
2 A. E. Ross
2 J. G. Harkness
2 F. Pocklington
2 F. J. Mylins
2 H. Walpole
1 J. Creagh

6th (Royal First Warwickshire).

Colonel.

Hon. Sir C. Gore, K.C.B., K.H. l.g

Lieut.-Colonel.

1 J. E. Robertson

Captains.

2 W. Black
1 H. J. Lawrell

Lieutenant.

2 H. Kitchener

Ensigns.

2 J. B. Blair
1 A. Teevan

7th (Royal Fusiliers).

Colonel.

Sir J. B. Auchmuty, G.C.B. g

Majors.

1 C. E. Watson
1 G. H. Waller
2 A. G. Daubeny

Lieutenants.

1 W. P. Browne
2 W. J. Frampton

8th (The King's Regiment).

Lieut.-Colonels.

1 F. B. Haines. c
2 J. Hinde, C.B

Majors.

2 J. Johnston
1 A. C. Robertson l.c

Captains.

2 D. Beere
2 S. H. Dyer
2 R. C. D. Bruce
1 F. W. J. Dugmore
2 E. Tanner
2 R. Whitting

Lieutenants.

2 *C. B. Brown
2 J. S. Wheeley
2 J. W. Hughes
2 J. F. F. Aylmer
1 W. W. Madden
2 J. P. Jones
2 T. H. Skinner

Ensigns.

2 W. W. Egerton
2 M. Stourton
2 B. F. Handy

9th (The East Norfolk).

Lieut.-Colonel.

1 W. Inglis

Major.

2 S. Darling

Captains.

1 H. B. Scott
1 J. H. H. Gammell

10th (North Lincoln).

Lieut.-Colonel.

1 H. E. Longden, C.B. c

Lieutenants.

1 E. A. Berger
1 F. Robertson

11th (North Devon).

Colonel.

Sir R. Doherty. l.-g

Captain.

1 P. Philpot

Lieutenant.

2 E. H. Hare

12th (East Suffolk).

Colonel.

C. A. F. Bentinck. l.-g

Majors.

1 J. F. Kempt. l.-c
2 *J. W. Espinasse

Captains.

2 T. Dundas
1 *J. L. Wilkie
1 F. A. Fitz-Gerald

Lieutenants.

2 G. De L. Lacy
2 J. O. Johnson
2 W. S. H. Dunlevie
2 H. J. MacDonnell

Assistant-Surgeon.

1 J. W. C. N. Murphy

13th (Prince Albert's Light Infantry).

Colonel.

Sir William M. Gomm, G.C.B. g

Lieut.-Colonels.

1 Lord M. Kerr, C.B. c
1 G. King

Major.

1 *H. C. Marriott

Captains.

1 F. Van Straubenzee. m
1 C. P. Long
2 C. P. Cobbe
1 J. A. Rowley
2 A. S. Jones. m
2 H. E. Hall

Lieutenants.

2 T. T. Gould
1 H. A. C. Wroughton
1 W. L. Smith

14th (Buckinghamshire).

Colonel.

Sir James Watson, K.C.B. g

Lieut.-Colonels.

1 R. Budd
2 *Sir J. E. Alexander. c

Majors.

1 *W. C. Trevor
1 E. J. Holworthy

Captains.

1 C. E. Grogan
1 J. G. Maycock
1 M. Petrie
1 T. P. Cosby
2 W. Haywood
1 A. A. Le Mesurier
2 J. D. Mackenzie
1 C. E. S. Gleig, m

Lieutenants.

1 C. Costin
1 H. A. Burton
1 J. Laing

Ensigns.

1 H. A. Williams
1 H. M. L. Hutchinson

Paymaster.

1 W. Macdonnell

Surgeon.

1 G. S. King, M.D

15th (York, East Riding).

Lieut.-Colonel.

1 J. A. Cole. c

Captains.

2 P. A. A. Twynam
1 A. Oldfield
1 H. Nangle

Lieutenant.

2 C. E. Layard

Ensign.

1 *A. S. Boom

16th (Bedfordshire).

Colonel.

S. H. Berkeley. g

Lieut.-Colonel.

1 G. J. Peacocke

Major.

2 C. L. De Winton

Captains.

1 C. Armstrong. m
2 G. C. S. Lombard

Lieutenant.

2 H. Kelsall

17th (Leicestershire).

Colonel.

Sir Richard Airey, K.C.B. m.-g

Major.

2 D. L. Colthurst

Captain.

2 A. C. Elliot

Lieutenants.

2 J. J. Percival
2 H. C. Deane

18th (Royal Irish).

Lieut.-Colonel.

1 J. T. Grant, C.B. c

Major.

2 G. J. Carey. c

Captains.

1 *G. H. Pocklington
2 V.C. Sir H. M. Havelock, Bt. l.-c
1 T. D. Baker
2 H. G. A. Vicars

Lieutenant.

1 J. Wily

19th (1st York. North Riding).

Colonel.

Sir A. J. Cloete, C.B. m.-g

Lieut.-Colonels.

1 G. V. Mundy, C.B. c
1 R. O. Bright
2 *R. Warden

Major.

2 L. Graham. l.-c

Captain.

2 E. St. J. Griffiths

20th (East Devonshire).

Captains.

1 J. T. N. O'Brien. m
2 E. M. Jones

21st (Royal North British Fusiliers).

Colonel.

Sir De Lacy Evans, G.C.B. g

Lieut.-Colonel.

2 E. W. D. Lowe, C.B

Major.

2 E. A. T. Steward

Captains.

1 J. Aldridge. m
1 C. Peddie
2 *A. Templeman
1 J. C. Sheffield
2 W. H. Carleton
2 S. G. B. St. Clair
1 T. B. Hollway
2 A. Breedon
1 A. Holt
2 R. W. C. Winsloe

Lieutenant.

2 A. W. Channer

Ensigns.

2 F. Walker
2 H. Feilden
2 T. W. P. Airey

Quarter-Master.

1 G. Grahame

22nd (The Cheshire).

Colonel.

Sir J. L. Pennefather, K.C.B l.-g

Lieut.-Colonels.

1 F. P. Harding, C.B. c
2 D. Anderson

Majors.

1 T. Young
2 W. M. Molony

Captains.

1 W. M'Bean
1 J. L. Thursby
2 J. S. Swann
1 S. Winthrop

Lieutenant.

2 H. A. Gosset

23rd (Royal Welch Fusiliers).

Colonel.

Sir W. J. Codrington, K.C.B l.-g

Lieut.-Colonel.

1 R. Pratt, C.B. c

Majors.

2 E. G. Bulwer, C.B. l.-c
2 J. Gubbins
1 *H. D. Torrens. l.-c

Captains.

2 B. Granville. m
2 D. Reid
2 C. G. Blane
2 *E. Armstrong

Lieutenants.

2 G. W. H. Bussell
2 F. W. Hutton
2 J. H. Walwyn
2 G. W. Lewis
1 A. M. Molyneux

Quarter.-Master.

2 G. Burden

Assistant-Surgeon.

2 R. W. Berkeley

24th (2nd Warwickshire).

Colonel.

P. Taylor, K.H. m.-g

Captains.

2 *T. Clark
1 H. H. Godwin-Austen

Lieutenants.

1 *T. P. Butler
2 W. A. H. Plasket

Ensign.

1 C. J. Stone

25th (The King's Own Borderers).

Captains.

1 F. C. Kennedy
2 E. G. Horne

Paymaster.

1 W. Brumell. m

26th (Cameronians).

Colonel.
Sir P. Bainbrigge, K.C.B. g

Captain.
W. E. Lockhart

Ensign.
J. R. G. Buchanan

27th (Inniskilling).

Colonel.
J. Geddes, K.H. l.-g

28th (North Gloucestershire).

Colonel.
Sir H. J. W. Bentinck, K.C.B. l.-g

29th (Worcestershire).

Colonel.
U. Lord Downs, G.C.B. g

30th (Cambridgeshire).

Colonel.
Marquis of Tweeddale, K.T.C.B. g

Paymaster.
*G. F. Lamert

31st (Huntingdonshire).

Colonel.
P. E. Craigie, C.B. l.-g

Captain.
A. Mitchell

Lieutenant.
G. N. Pepper

Ensign.
H. W. Bateman

32nd (Cornwall) Light Infantry.

Colonel.
Sir J. E. W. Inglis, K.C.B. m.-g

Lieut.-Colonel.
G. G. C. Stapylton

Captain.
R. S. Colls. m

33rd (The Duke of Wellington's Regiment).

Colonel.
Sir C. Yorke, G.C.B. l.-g

Lieut.-Colonel.
J. E. Collings

Major.
H. C. Fitz-Gerald

Captain.
*F. S. Vacher. m

34th (Cumberland).

Colonel.
J. Eden, C.B. l.-g

Major.
J. Maxwell

Captains.
E. H. Marsh
A. T. L. Chapman
A. W. Boyce
J. L. Moore
T. H. Saunders
J. D. Laurie

Lieutenants.
W. M. Dunbar
R. J. P. Leeson
C. E. Leeson
C. H. Webb

35th (Royal Sussex).

Captain.
R. C. Stewart. m

Lieutenant.
T. Lloyd

Ensign.
F. B. Gipps

36th (Herefordshire).

Colonel.
W. H. Scott. g

Lieut.-Colonel.
*J. J. Hort. c

Captain.
H. R. Twyford

Lieutenant.
Hon. C. I. F. Powys

37th (North Hampshire).

Colonel.
J. Fraser. l.-g

Captains.
J. R. Heaton. l.-c
F. J. N. Ind

Lieutenant.
R. Bunn

Surgeon.
J. W. Fleming

38th (1st Staffordshire)

Colonel.
Hon. H. Arbuthnot, C.B. g

Lieut.-Colonel.
W. O'G. Haly, C.B. c

Captain.
W. K. Ellis

39th (Dorsetshire).

Nil.

40th (2nd Somersetshire).

Colonel.
Sir Alexander Woodford G.C.B., G.C.M.G. g

Lieut.-Colonel.
A. Leslie

41st (The Welch).

Colonel.
Sir Richard England, G.C.B., K.H. l.-g

Captains.
C. P. Bertram. m
A. R. Fowler
E. L. B. Lowry

Lieutenant.
E. F. B. Brooke

42nd (The Royal Highland Regiment, The Black Watch).

Nil.

43rd (Monmouthshire Light Infantry).

Colonel.
Sir James Fergusson, G.C.B. g

Captains.
R. C. Glover
H. T. Trafford
C. R. Mure

Lieutenants.
F. G. E. Glover
T. M'Goun
E. Villiers
J. Hogarth

Paymaster.
*H. Morgan

Assistant Surgeon.
J. Good

44th (East Essex).

Colonel.
T. Reed, C.B. l.-g.

Major.
J. Hackett

45th (Nottinghamshire).

Captains.
H. W. Parish. m
J. J. Wood

Lieutenants.
F. W. S. Webber
H. B. Hayward
W. Pearson
H. H. Hooke

Ensigns.
*H. J. B. Hancock
O. W. De Thoren

Paymaster.
J. D. Blythe

46th (South Devonshire).

Colonel.
C. A. Windham, C.B. m.-g

47th (The Lancashire).

Majors.
*R. W. Lowry. l.-c
H. C. Lodder

48th (Northamptonshire).

Lieut.-Colonel.
A. N. Campbell

49th (The Princess Charlotte of Wales', or Hertfordshire).

Lieut.-Colonel.
C. A. Edwards, C.B. c

Captain.
C. E. Gibson

Lieutenant.
C. F. Eustace

50th (Queen's Own).

Colonel.
G. M. Eden. m.-g

Captains.
*A. C. K. Lock. m
E. C. Antrobus
M. de S. M'K. G. A. Clarke

Lieutenants.
E. Leach
T. M. B. Eden
H. E. W. Preston
G. H. Turner
W. R. White

51st (The King's Own Light Infantry).

Lieut.-Colonel.
A. C. Errington. c

Captains.
S. A. Cleeve
M. C. Farrington

Lieutenant.
G. S. Robertson

Ensign.
R. Stratford

52nd (Oxfordshire) Light Infantry.

Colonel.
Sir Wm. Rowan, K.C.B. l.-g

Majors.
A. L. Peel
*J. J. Bourchier

Captains.
Hon. E. G. Curzon
S. J. Blane. l.-c

Lieutenants.
T. B. Cowburn
H. A. Adair

53rd (The Shropshire).

Colonel.
F. Maunsell. m.-g

54th (West Norfolk).

Colonel.
M. Fane. l.-g

Captain.
V. T. Bayly

55th (Westmorland).

Colonel.
W. H. Elliott, K.H. m.-g

Captains.
S. W. F. Wilson
P. L. Bellamy

56th (West Essex).

Colonel.
H. W. Breton. m.-g

Captain.
W. G. Margesson

Lieutenants.
R. T. Thompson
A. R. Heyland
M. C. Garsia

57th (West Middlesex).

Colonel.
Sir J. F. Love, K.C.B., K.H. l.-g

Lieut.-Colonel.
H. J. Warre, C.B. c

Lieutenant.
C. M. Clarke

Ensign.
A. C. Manners

58th (Rutlandshire).

Colonel.
E. B. Wynyard, C.B. g

Captains.
W. D. Shipley
A. W. Hall
J. Horner

Ensign.
H. T. Butler

59th (2nd Nottinghamshire).

Major.
W. W. Lodder. l. c

60th (The King's Royal Rifle Corps).

Colonel-in-Chief.
Viscount Gough, K.P., G.C.B. g

Colonel-Commandant.
Sir W. G. Moore, K.C.B. l.-g

Majors.
1 C. N. North. l.-c
4 R. J. Feilden

Captains.
3 J. P. Battersby
4 C. H. S. Churchill. m
4 *F. S. Travers
4 N. Burslem

Lieutenants.
2 J. A. Morrah
2 W. H. Mosely

61st (South Gloucestershire).

Colonel.
J. Reeve. g

Lieut.-Colonel.
J. P. Redmond

Captain.
H. J. Yonge

62nd (The Wiltshire).

Colonel.
W. T. Knollys. l.-g

Lieut.-Colonel.
*W. L. Ingall, C.B. c

Major.
J. Daubeny, C.B. c

Captains.
G. H. Wilkinson
G. Hay

Lieutenant.
G. F. Grant

63rd (The West Suffolk).

Colonel.
T. Kenah, C.B. g

Major.
*F. D. Grey

Captain.
G. W. Clutterbuck

Lieutenants.
R. W. B. Crowther
J. P. Boyd
J. S. Smyth
T. Atkinson
T. Scovell

64th (2nd Staffordshire).

Colonel.
J. Freeth, K.H. l.-g

Major.
T. Anderson

Captain.
*G. D. Barker. m

65th (2nd Yorkshire, North Riding).

Major.
G. F. Murray. l.-c

Captain.
*C. Blewett

Ensign.
A. H. Heyland

66th (Berkshire).

Captain.
J. Walker

67th (South Hampshire).

Colonel.
F. J. Davies. l.-g

Lieut.-Colonel.
T. E. Knox, C.B.

Major.
J. Porter. l.-c

Captains.
D. Thompson
F. W. Jebb

68th (The Durham) Light Infantry.

Lieut.-Colonel.
H. H. Greer

Major.
H. H. Morant

Captains.
C. C. Fitzroy
G. J. A. Oakley

Lieutenant.
H. G. Cavendish

69th (South Lincoln)

Colonel.
E. F. Gascoigne. l.g

Lieut.-Colonel.
*D. E. Mackirdy. c

Captains.
G. Bagot
T. H. Charleton
R. A. Leggett

70th (The Surrey).

Colonel.
Sir G. W. Paty, K.C.B., K.H. l.g

Lieut.-Colonel.
T. J. Galloway. c

Assistant-Surgeon.
W. E. Alston, M.D

71st (Highland) Light Infantry.

Lieut.-Colonels.
W. Hope, C.B
G. W. T. Rich

Major.
J. A. Gore

Captains.
C. J. Mounsay
C. H. S. Scott

Lieutenants.
R. Lewis
R. J. Isacke
J. H. Leslie

72nd (Duke of Albany's Own Highlanders).

Colonel.
Sir J. Aitchison, K.C.B. g

Surgeon.
W. C. Seaman, M.D

73rd Regiment.

Majors.
H. M. Jones
W. E. Bewes. l.c

Captains.
W. C. O'Brien
F. Reeve
S. V. F. Henslowe

Ensigns.
J. T. Turner
G. S. Holroyd

74th (Highlanders).

Colonel.
C. A. Shawe. l.-g

Captain.
*Hon. J. B. J. Dormer

Lieutenant.
J. T. Evans

Assistant-Surgeon.
A. Chester

75th Regiment.

Colonel.
St. J. A. Clerke, K.H. l.-g

Captain.
C. H. Malan

76th Regiment.

Colonel.
W. Jervois, K.H. g

Lieut.-Colonel.
*H. Smyth, C.B. c

Surgeon.
A. Bell

77th (East Middlesex).

Colonel.
Lord Rokeby, K.C.B. l.-g

Lieut.-Colonels.
Hon. A. G. C. Chichester
*T. J. Deverell. c

Lieutenant.
C. B. Knowles

78th (Highlanders).

Captain.
O. B. Feilden

79th (Cameron Highlanders).

Lieut.-Colonel.
T. B. Butt

Captains.
G. T. Scovell
G. A. Harrison

80th Staffordshire Volunteers.

Colonel.
T. W. Robbins. l.-g

81st (Loyal Lincoln Volunteers).

Colonel.
T. Evans, C.B. g

Lieut.-Colonel.
H. Renny. c

82nd (The Prince of Wales's Volunteers).

Colonel.
Hon. T. Ashburnham, C.B. l.-g

Lieutenant.
C. J. East

83rd (County of Dublin).

Colonel.
Sir F. Stovin, G.C.B., G.C.M.G. g

Lieutenants.

G. G. Beazley
*J. E. Brymer

84th (York and Lancaster).

Colonel.

Sir G. A. Wetherall, K.C.B., K.H. l.-g

Lieutenant.

W. A. Atcherley

85th (The King's Light Infantry).

Colonel.

Sir J. W. Guise, Bart., K.C.B. g

Captain.

W. T. Baker

Lieutenants.

W. H. Mathew
W. Galbraith
J. M. Grant

86th (Royal County Down).

Major.

F. S. Savage

87th (Royal Irish Fusiliers).

Colonel.

Sir J. Simpson, G.C.B. g

Captain.

L. H. Hamilton. m

88th (Connaught Rangers).

Captain.

*J. G. Cross

89th Regiment.

Nil.

90th Light Infantry.

Colonel.

A. F. Macintosh, K.H. l.-g

Lieutenant.

J. F. Haig.

91st (Argyllshire).

Colonel.

C. M. Hay. l.-g

Lieut.-Colonel.

*W. T. L. Patterson

Major.

W. B. Battiscombe

Captains.

J. C. Sweny
W. R. D'Eye

Lieutenants.

H. R. Spearman
C. L. Harvey

92nd (Highlanders.

Lieut.-Colonel.

A. J. Lockhart, C.B. c

Captain.

G. H. Best

Lieutenant.

C. A. Humfrey

93rd (Highlanders).

Colonel.

W. Sutherland, C.B. l.-g

Captains.

H. W. Burroughs. m
*W. W. Knollys

Lieutenant.

A. O. Tabuteau

94th Regiment.

Colonel.

G. P. Higginson. l.-g

Lieut.-Colonel.

C. J. C. Mills. c

Captains.

*H. L. Cafe
T. G. Peacocke
F. H. Elliot

Lieutenants.

S. Malthus
G. J. Teevan
R. Stewart
P. R. Anstruther
J. B. Pilkington
J. Mackinlay
W. G. Buller

Ensign.

P. Richards

Paymaster.

H. J. Wahab

Assistant-Surgeons.

E. M'Grath
J. G Leask, M.B

95th (The Derbyshire).

Colonel.

Sir F. Cockburn. g

Lieut.-Colonels.

J. R. Raines, C.B. c
*Hon. F. A. Thesiger

Captain.

G. L. Carmichael. m

Lieutenant.

E. Chapple

Surgeon.

J. Gibbons

96th Regiment.

Lieut.-Colonel.

E. W. Scovell. c

Captains.

J. B. Kirk
Hon. D. J. Monson

97th (Earl of Ulster's).

Colonel.

E. F. Morris, C.B. l.-g

Lieutenants.

M. G. B. Fitzgerald
J. W. Shawe

Assistant-Surgeon.

S. E. Maunsell

98th Regiment.

Colonel.

W. L. Darling. l.-g

Lieut-Colonel.

D. Rainier

Major.

F. Peyton.

Captain.

F. H. Crawford

99th (Lanarkshire).

Majors.

M. H. Dowbiggin. l.-c
C. Blamire

100th (Prince of Wales's Royal Canadian) Regiment.

Colonel.

Viscount Melville, K.C.B. l.-g

Captains.

H. Cook
A. F. A. Slade

Ensign.

H. W. Ashford

RIFLE BRIGADE.

Colonel-Commandant.

Rt. Hon. Sir G. Brown, G.C.B., K.H. g

Lieut.-Colonel.

4 T. R. Elrington

Majors.

4 Hon. G. Elliot
2 H. Walker
1 E. M. Buller

Captains.

3 *YC* C. T. Bourchier. m
4 E. W. Blackett
1 *H. J. Maclean
1 *YC* W. J. M. Cunninghame
3 G. E. Rose
4 J. C. Moore
1 R. Tryon
2 J. Clerk

2 J. B. B. Coulson
1 R. E. S. Harington
3 H. Wood
2 F. H. A. Seymour
1 C. G. Slade

Lieutenants.

1 H. B. H. Blundell
3 A. Green
4 H. A. S. T. Mildmay
1 Hon. A. J. Pennington
2 F. W. Ramsbottom
1 G. E. Boyle
3 C. H. Turnor

Ensigns.

1 J. S. Hardy
4 C. Fairfield

1st West India Regiment.

Colonel.

Sir Geo. Bowles, K.C.B. g

Lieut.-Colonel.

L. S. O'Connor, C.B. c

Captain.

J. Fanning

2nd West India Regiment.

Colonel.

J. W. Frith. m.g

Lieut.-Colonel.

H. W. Whitfield. c

Major.

W. Hill

Lieutenant.

J. Sheil

3rd West India Regiment.

Colonel.

W. Wood, K.H., C.B. g

Lieutenant.

A. S. Hincks

Quartermaster.

*M. Doorly.

Ceylon Rifle Regiment.

Lieut.-Colonel.

W. T. Layard. c

Captains.

R. C. Watson
*J. Meaden
W. J. Gorman

Ensigns.

F. C. Baldwin
A. Randall

Cape Mounted Riflemen.

Captain.

*J. V. N. Pole

Lieutenant.

E. Y. Brabant

Ensigns.

T. H. V. D. Hay
C. H. Marillier
C. J. M. Hallewell
C. St. C. Pote

Royal Canadian Rifle Regiment.

Lieut.-Colonel.

W. H. Bradford

Major.

K. M. Moffatt

Captain.

*C. W. Grange. m

Royal Newfoundland Companies.

Major.

J. J. Grant. l.-c

SCHOOL OF GUNNERY, WOOLWICH.

Commandant and Superintendent.

Colonel A. J. Taylor, R.A.

Major of Brigade.

Lieut.-Colonel S. E. Gordon, R.A.

Instr. in Gunnery.

Lieut.-Colonel F. B. Ward
Major G. A. Milman

Carbine Instructor.

Lieutenant R. W. Phipps.

SCHOOL OF MUSKETRY, HYTHE.

Commandant & Inspector-General.

Major-General C. C. Hay

DISTRICT INSPECTORS.

Dublin.

Captain D. Thompson

Cape of Good Hope.

Major H. B. Scott

DEPOT BATTALIONS.

Cavalry—Maidstone.

Commandant.

J. C. H. Gibsone. c

Assistant-Commandant.

*Lieut.-Col. C. H. Teush-Hecker

Cavalry—Canterbury.

Major.

E. Tomkinson. l.-c

Infantry—2nd, Chatham.

Lieut.-Colonel.

R. N. Phillips. c

Major.

*W. L. Stewart. l.-c

5th, Parkhurst.

Lieut.-Colonel.

E. R. Jeffreys, C.B. c

Major.

F. B. Tritton

6th, Walmer.

Paymaster.

*H. S. S. Burney. m

7th, Winchester.

Lieut.-Colonel.

*A. M. M'Donald

Major.

A. Wombell

Assistant Instructor of Musketry.

Ensign C. Fairfield

9th, Colchester.

Major.

C. J. O. Swaffield

10th, Colchester.

Instructor of Musketry.

*Captain A. T. L. Chapman

11th, Preston.

Major.

*G. Skipwith

12th, Athlone.

Major.

J. Nason

Paymaster.

*G. T. Benson. m

15th, Buttevant.

Lieut.-Colonel.

F. G. Wilkinson

16th, Templemore.

Major.

*E. J. Charter

17th, Limerick.

Lieut.-Colonel.

A. Borton, C.B. c

Major.
*G. N. K. A. Yonge

Paymaster.
A. Fair

18th, Fermoy.
Lieut.-Colonel.
*C. R. Egerton. c

19th, Fermoy.
Major.
*C. R. Chichester

20th, Cork.
Assistant-Instructor of Musketry.
Lieut. W. A. H. Plasket

21st, Chichester.
Major.
E. W. C. Wright. c

22nd, Stirling.
Paymaster.
*J. P. Hall. m

Invalid Depot, Chatham.
Captain.
J. F. De Teissier. l.-c

Convalescent Establishment, Yarmouth.
Commandant.
Captain E. S. Jervois

Paymaster.
S. Naylor. m

RECRUITING DISTRICTS.

Liverpool.
Inspecting Field-Officer.
Colonel Sir J. Jones, K.C.B

Bristol.
Inspecting Field-Officer.
Colonel H. Cooper

Ipswich.
Superintendent Officer.
Lieut. M. G. B. Fitz-Gerald

Dublin.
Inspecting Field-Officer.
Colonel J. P. Sparks, C.B

Athlone.
Superintendent Officer.
Captain T. Gardiner

Cork.
Inspecting Field-Officer.
Colonel R. Gardiner

Paymaster.
W. H. Fitzgerald. m

STAFF OFFICERS OF PENSIONERS.

Glasgow.
Colonel W. Campbell

Ipswich.
Major S. A. Capel

London.
Captain R. M'Nair
Colonel G. H. F. Campbell
Major R. S. O'Brien
Colonel J. J. Graham
Major F. C. Christie

Plymouth.
Lieut.-Colonel H. Russell

Portsmouth.
Lieut.-Colonel G. W. Meehan

Limerick.
Major G. Bayly

Sunderland.
Colonel C. F. Parkinson

COMMISSARIAT DEPARTMENT.

Deputy-Commissary Generals.
F. T. Mylrea
H. B. Morse
F. S. Carpenter
W. J. T. Power, C.B
E. Strickland

Assistant-Commissary Generals.
A. Salway
E. B. De Fonblanque
R. Booth

Dep. Ass.-Com. Gens.
A. F. Cookesley
E. Turnbull

MEDICAL DEPARTMENT.

Director-Generals.
J. B. Gibson, M.D. C.B

Inspector-Generals.
T. G. Logan, M.D
J. E. Williams

Dep. Ins.-Gens.
R. Lawson
J. D. M'Illree
T. Longmore
R. J. O'Flaherty
T. G. Balfour, M.D
H. Mapleton, M.D
D. Machlachlan, M.D

Staff Surgeon-Major.
G. M. Webster, M.D
E. S. Docker

Staff-Surgeons.
D. R. Mackinnon
H. F. Smith, M.D
T. Ligertwood, M.B
T. C. Brady

Staff Assistant-Surgeons.
J. Clarke, M.D
E. G. Nott

PURVEYOR'S DEPARTMENT.

Purveyor.
S. C. Harrington

CHAPLAIN'S DEPARTMENT.

Chaplain-General.
Rev. G. R. Gleig. M.A

Chaplains.
Rev. R. W. Browne, M.A
Rev. W. Sykes, M.A

Barrack Masters.

Woolwich.
Major E. Sutherland

London.
Major L. White

Parkhurst.
Lieut. G. H. Sanders

Royal Marines, Light Infantry.

Colonel-Commandant.
1 E. Rea
4 F. A. Campbell

Colonels and Second Commandants.
3 T. Lemon, C.B
1 T. C. C. Moore

Lieut.-Colonels.
G. C. Langley art
1 W. H. March

Captains.
1 P. H. Fellowes

Lieutenants.
3 J. G. Shanks
2 W. W. G. B. Willis
1 W. J. Barker

Deputy Adjutant-General.
Major-Gen. S R. Wesley

Assistant Adjutant-General.
Lieut.-Colonel J. O. Travers, C.B

Military Prisons.

Inspector-General.
Major-Gen. Sir J. Jebb, K.C.B

Governor.
Major J. H. Rutherford

Royal Military College at Sandhurst.

Governor.
Lt.-Gen. Sir H. D. Jones, G.C.B

CADETS' COLLEGE.
Superintendent of Studies.
Colonel T. E. Lacy

PROFESSORS AND MASTERS.
Fortifications.
Colonel W. H. Adams
Captain G. Philips, R.E
Captain L. Griffiths, R.A

Military Surveying.
Major R. Petley

Military Drawing.
Captain W. Paterson

Military History.
Captain C. C. Chesney, R.E

STAFF COLLEGE.
Commandant.
Colonel W. C. E. Napier

PROFESSORS AND MASTERS.
Military History.
Lieut.-Colonel E. B. Hamley, R.A

Fortifications and Artillery.
Captain C. E. Mainwaring, R.A

Military Topography.
Captain S. B. Farrell, R.E

Military Administration.
Captain W. Walker

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Marquis of Winchester

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Viscount Enfield

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F. S. M. Stephens

Lieutenant.

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C. Godson

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J. Scriven

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